

	Type	L #	Hits	Search Text	DBs
1	BRS	L1	605	399/350,343.ccls.	US- PGPUB; USPAT
2	BRS	L2	373	399/71,98,99.ccls.	US- PGPUB; USPAT
3	BRS	L3	335	2 not 1	US- PGPUB; USPAT
4	BRS	L4	426	430/125.ccls.	US- PGPUB; USPAT
5	BRS	L5	340	4 not (1 or 2)	US- PGPUB; USPAT
6	BRS	L6	373	15/1.51.ccls.	US- PGPUB; USPAT
7	BRS	L7	314	6 not (1 or 2 or 4)	US- PGPUB; USPAT
8	BRS	L8	573	15/256.5.ccls.	US- PGPUB; USPAT
9	BRS	L9	503	8 not (1 or 2 or 4 or 6)	US- PGPUB; USPAT
10	BRS	L10	1552	427/430.1.ccls.	US- PGPUB; USPAT
11	BRS	L11	1551	10 not (1 or 2 or 4 or 6 or 8)	US- PGPUB; USPAT
12	BRS	L12	1073	427/180.ccls.	US- PGPUB; USPAT
13	BRS	L13	1051	12 not (1 or 2 or 4 or 6 or 8 or 10)	US- PGPUB; USPAT
14	BRS	L14	324	427/145.ccls.	US- PGPUB; USPAT
15	BRS	L15	320	14 not (1 or 2 or 4 or 6 or 8 or 10 or 12)	US- PGPUB; USPAT

	Type	L #	Hits	Search Text	DBs
16	BRS	L16	380674	(coat\$3 or attach\$4 or add\$5 or adher\$3) with (particle\$1 or powder\$1 or toner\$1 or lubrica\$5)	US-PGPUB; USPAT
17	BRS	L17	13435	clean\$3 near2 blade\$1	US-PGPUB; USPAT
18	BRS	L18	1327	16 with 17	US-PGPUB; USPAT
19	BRS	L19	1052	18 not (1 or 2 or 4 or 6 or 8 or 10 or 12 or 14)	US-PGPUB; USPAT
20	BRS	L20	8036	mg adj1 "cm.sup.2"	US-PGPUB; USPAT
21	BRS	L21	9894	g adj1 "cm.sup.2"	US-PGPUB; USPAT
22	BRS	L22	10732	mg adj1 "m.sup.2"	US-PGPUB; USPAT
23	BRS	L23	42332	g adj1 "m.sup.2"	US-PGPUB; USPAT
24	BRS	L24	178	mg adj1 "mm.sup.2"	US-PGPUB; USPAT
25	BRS	L25	983	g adj1 "mm.sup.2"	US-PGPUB; USPAT
26	BRS	L26	62738	20 or 21 or 22 or 23 or 24 or 25	US-PGPUB; USPAT
27	BRS	L27	159	19 and 26	US-PGPUB; USPAT
28	BRS	L28	893	19 not 27	US-PGPUB; USPAT
29	BRS	L29	639	28 and "399"/\$3.ccls.	US-PGPUB; USPAT

	Type	L #	Hits	Search Text	DBs
30	BRS	L30	130615	(coat\$3 or attach\$4 or add\$5 or adher\$3) with (particle\$1 or powder\$1 or toner\$1 or lubrica\$5)	EPO; JPO
31	BRS	L31	5246	clean\$3 near2 blade\$1	EPO; JPO
32	BRS	L32	383	30 with 31	EPO; JPO
33	BRS	L33	39024	g03g021/00.ipc. or g03g021/10.ipc.	EPO; JPO
34	BRS	L34	294	32 and 33	EPO; JPO
35	BRS	L35	89	32 not 34	EPO; JPO

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*not disclosing in an amount of 1 to 10 mg/cm<sup>2</sup>*

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CLAIMS

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[Claim(s)]

[Claim 1] A developer is supplied to the electrostatic latent image on a means to form an electrostatic latent image in image support, and this image support. A development means to develop this electrostatic latent image, an imprint means to imprint the developer image on this image support to imprinted material, A cleaning means to remove the developer which remained on image support after the imprint by making a tabular elastic body contact this image support is provided. And said developer Image formation equipment characterized by including the polymerization toner obtained by carrying out a polymerization in the solution containing a polymerization nature monomer and a coloring agent, and at least one sort of non-subtlety particles chosen from the group which consists of a metallic oxide, a metal nitride, metallic carbide, and a metal salt as a cleaning assistant.

[Claim 2] The specific surface area containing a coloring matter component and resin is per [ unit area ]  $0.5 \times 10^{-3}$  -  $50 \times 10^{-3}$  g/m<sup>2</sup> to the toner and this toner front face below 20m<sup>2</sup> / g. Developer characterized by providing at least one sort of non-subtlety particles chosen from the group which consists of the metallic oxide to which it adhered, a metal nitride, metallic carbide, and a metal salt.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the developer used for the image formation by the formation of a visible image of an electrostatic latent image, and the image formation equipment using this developer.

[0002]

[Description of the Prior Art] Conventionally, as a xerography, many approaches are proposed as a Carlsson process base until now. By such approach, negatives are developed by making the particle which forms an electrostatic latent image in the photo conductor which generally used the photoconductivity matter, next is called a toner to this latent image adhere alternatively, and this latent image is developed. After imprinting the toner which developed to imprint material, such as paper, an image is obtained by being established with heat and a pressure, or a solvent steam.

[0003] As a development method, it is greatly divided into a dry-developing method and a liquid development method, and the magnetic brush developing-negatives method, the cascade developing-negatives method, etc. are learned as a 2 component development method which uses a carrier as a dry-developing method further. The toner used for these development methods is further classified into insulation and conductivity. The toner generally used for these development method is a particle which is the mean particle diameter of about 10 micrometers by which coloring agents, such as a color and a pigment, an electrification control agent, etc. were distributed in this binder resin by most consisting of binder resin.

[0004] Furthermore, in order to use these particles for the aforementioned development method, various chemical property and physical characteristics are required. Also in this, much proposals are made to coherent and the fluidity which affect toner conveyance, and raising a fluidity by processing to which surface treatment, for example, silica powder, is made to adhere on the surface of a toner is known. Surface treatment of a toner is performed by various non-subtlety particles to others for the purpose of the improvement in a fluidity, electrification nature, the cleaning nature from a photo conductor, etc.

[0005] The particle adhering to such a toner front face has affected the own amount of electrifications of a toner greatly. The amount of toners developed on a photo conductor according to the amount to which the particle adhered, or a condition is decided. For this reason, such a particle influences the amount of development toners, image concentration, the amount of consumption toners, etc. For example, when a silica is made to adhere to a toner, the amount of electrifications becomes high, so that there are many amounts which the silica made adhere, and the amount of consumption toners decreases. Although a fluidity will go up if a silica is made to adhere, there is an inclination for image concentration to become low according to LIFE. The amount of electrifications becomes low, so that there are few amounts which the silica made adhere on the contrary, and there is an inclination for the amount of consumption toners to increase. That is, the amount which adds particles, such as a silica, to a toner making the property of LIFE stability must be made the optimal.

[0006] The approach of making it adhere according to the mechanical force using mixers made to adhere

to a toner particle front face with heat as an approach to which the particle which consists of various matter is made to adhere using a fluidized-drying furnace etc., such as an approach and a ball mill, etc. is learned. Moreover, generally as the manufacture approach of this toner particle, the kneading grinding method, the spray-drying method, the polymerization method, etc. are learned.

[0007] Recent years especially, it changes to the conventional kneading grinding method, and the manufacture approach of the toner by the polymerization method is proposed. This polymerization method performs a polymerization reaction, making the additive of a polymerization monomer, a coloring agent, a surfactant, and others distribute or suspend in an aqueous solution, and stirring it under predetermined temperature, concentration, and power, and obtains the toner which has a predetermined particle size. According to this polymerization method, a toner with comparatively narrow particle size distribution is obtained, and magnetic powder, a coloring agent, etc. distribute to homogeneity comparatively. Since there are no processes which furthermore start as for cost, such as melting and grinding, a cheap toner can be supplied.

[0008] Moreover, in order to attain high definition-ization, it is said that the policy which makes particle size of a toner small is effective, but since the surface area of a toner particle becomes large when toner particle size is made smaller than before, it is possible [ it ] that the optimal addition of a particle changes. Then, the need of deciding the addition of the particle corresponding to the surface area of the toner which changes with toner particle size comes out.

[0009] Since a chemical reaction is made to generate a toner particle when a polymerization method is used, the diameter toner of a granule is made easily. The configuration of a particle tends to become round on the property in which the toner obtained by the polymerization method is generated by the chemical reaction. It is hard coming to condense a toner and a fluidity becomes good, so that a configuration approaches a globular form.

[0010] However, for example, at a development process, in order to remove the toner which remained on the photo conductor after the imprint, when using the cleaning device which used the cleaning blade, the thing which has a round toner particle will not be able to be easily caught in a cleaning blade, and will pass through a blade. Therefore, generally the cleaning nature of a polymerization toner is insufficient.

[0011] On the other hand, in order that the toner obtained by the kneading grinding method may grind the raw material made solid until it becomes a predetermined particle size, the configuration of a particle is square by the indeterminate form. Since such a toner tends to be caught in a cleaning blade, compared with a polymerization toner, its cleaning nature is good. However, particle shape also affects properties other than the cleaning engine performance. For example, it is easy to crush a toner for the stress within a development counter, so that particle shape becomes an indeterminate form, and a very fine particle increases. A very fine particle becomes toner scattering and the cause of a fogging. Moreover, particle shape affects coherent [ of a toner ], and a lifting and the fluidity to like worsen condensation, so that a configuration becomes an indeterminate form. The toner which caused this condensation appears in the outputted image, and the phenomenon of a white omission is seen by using a toner aggregate as a nucleus especially at a solid black image.

[0012]

[Problem(s) to be Solved by the Invention] As mentioned above, even if it prepared the cleaning blade in image formation equipment and formed the image conventionally, it was difficult to satisfy a good image property.

[0013] Then, the purpose of this invention is good, toner scattering cannot take place easily, and it is fogged and cleaning nature is to offer the image formation equipment with which a good image without a white omission etc. is obtained. Moreover, other purposes of this invention fog and are to offer the developer with which a good image without a white omission etc. is obtained.

[0014]

[Means for Solving the Problem] The image formation equipment of this invention supplies a developer to the electrostatic latent image on a means to form an electrostatic latent image in image support, and this image support. A development means to develop this electrostatic latent image, an imprint means to

imprint the developer image on this image support to imprinted material, A cleaning means to remove the developer which remained on image support after the imprint by making a tabular elastic body contact this image support is provided. And said developer It is characterized by including the polymerization toner obtained by carrying out a polymerization in the solution containing a polymerization nature monomer and a coloring agent, and at least one sort of non-subtlety particles chosen from the group which consists of a metallic oxide, a metal nitride, metallic carbide, and a metal salt as a cleaning assistant.

[0015] As a cleaning assistant added to the toner used for this invention  $\text{CeO}_2$ ,  $\text{SrTiO}_3$ ,  $\text{CrO}$ ,  $\text{SiO}_2$ ,  $\text{TiO}_2$ ,  $\text{ZnO}$ , oxides, such as aluminum  $2\text{O}_3$ ,  $\text{TiON}$ ,  $\text{TiBaO}_3$ ,  $\text{MgO}$ ,  $\text{ZrO}_2$ ,  $\text{CaCO}_3$ ,  $\text{NiO}$ , and  $\text{SnO}$ , and  $\text{SiN}_4$  etc. -- carbide, such as a nitride and  $\text{SiC}$ ,  $\text{CaSO}_4$ ,  $\text{BaSO}_4$ , and  $\text{CaCO}_3$  etc. -- non-subtlety particles, such as a metal salt, are mentioned. As for a cleaning assistant, it is desirable to use it in the range of 0.01 - 10 weight section to the toner 100 weight section.

[0016] Moreover, for the developer of this invention, the specific surface area containing a coloring matter component and resin is per [ unit area ]  $0.5 \times 10^{-3} - 50 \times 10^{-3} \text{ g/m}^2$  to the toner and this toner front face below  $20 \text{ m}^2 / \text{g}$ . It is characterized by providing at least one sort of non-subtlety particles chosen from the group which consists of the metallic oxide to which it adhered, a metal nitride, metallic carbide, and a metal salt.

[0017] As a non-subtlety particle, like the above-mentioned cleaning assistant,  $\text{CeO}_2$ ,  $\text{SrTiO}_3$ ,  $\text{CrO}$ ,  $\text{SiO}_2$ ,  $\text{TiO}_2$ ,  $\text{ZnO}$ , and aluminum  $2\text{O}_3$ , oxides, such as  $\text{TiON}$ ,  $\text{TiBaO}_3$ ,  $\text{MgO}$ ,  $\text{ZrO}_2$ ,  $\text{CaCO}_3$ ,  $\text{NiO}$ , and  $\text{SnO}$ , and  $\text{SiN}_4$  etc. -- carbide, such as a nitride and  $\text{SiC}$ ,  $\text{CaSO}_4$ ,  $\text{BaSO}_4$ , and  $\text{CaCO}_3$  etc. -- non-subtlety particles, such as a metal salt, are mentioned. The particle size of these particles is 5 micrometers or less, and 0.5 micrometers or less are preferably suitable for it. Moreover, surface treatment of these particles may be carried out with the organic compound of coupling agents, such as a silane coupling agent, a titanium coupling agent, and a zircoaluminate coupling agent, a silicone oil, or others. There are also particles, such as  $\text{CeO}_2$ ,  $\text{SrTiO}_3$ , and  $\text{CrO}$ . These metal particles can also be added as an additive of the developer containing the cleaning assistant used for the image formation equipment of this invention.

[0018] The approach of making it adhere according to the mechanical force using mixers made to adhere to a toner front face with heat using a fluidized-drying furnace etc. as an approach to which a metallic-oxide particle or a cleaning assistant is made to adhere, such as an approach and a ball mill, etc. is used.

[0019] By these approaches, since the adhesion force of the metallic-oxide particle or cleaning assistant adhering to a toner front face is weak, it is easy to secede from a toner front face at the time of toner conveyance and development. This becomes easy to condense toners and the fluidity of a toner may fall. Therefore, in the fall of development concentration, or the solid section of an image, the white omission development by toner condensation may occur. Moreover, the particle which seceded from the toner front face is accumulated into a development counter or other equipments, and becomes degradation of an image and the cause of equipment failure. Furthermore the particle has affected the own amount of electrifications of a toner greatly, and there is an inclination for the amounts of electrifications of each toner to differ in the state of adhesion of the particle in a toner front face, and to worsen a development property.

[0020] Then, it is desirable on a toner front face to carry out adhesion immobilization of the particle by performing the so-called mechanochemical reaction which gives mechanical impulse force as the metallic-oxide particle on the front face of a toner, or the adhesion approach of a cleaning assistant. As a fine-particles processor which performs a mechanochemical reaction, for example, a high BURIDAIZENSHON system (made in the Nara machine factory), a mechano fusion system (Hosokawa Micron make), etc. can be used.

[0021] As a polymer monomer of the polymerization toner used for this invention Styrene, o-methyl styrene, m-methyl styrene, p-methyl styrene, p-methoxy styrene, p-phenyl styrene, p-KURORU styrene, 3, 4-dichloro styrene, p-ethyl styrene, 2, 4-dimethyl styrene, p-n-butyl styrene, p-tert-butyl styrene, p-n-hexyl styrene, p-n-octyl styrene, p-n-nonyl styrene, p-n-DESHIRU styrene, Styrene and its derivatives, such as p-n-dodecyl styrene; Ethylene, Ethylene partial saturation monoolefins, such as a propylene, a

butylene, and an isobutylene; A vinyl chloride, Halogenation vinyl, such as vinylidene-chloride, vinyl bromide, vinyl, etc. fluoride; Vinyl acetate, Vinyl ester, such as propionic-acid vinyl and BENZOE acid vinyl, a methyl methacrylate, Ethyl methacrylate, methacrylic-acid propyl, n-butyl methacrylate, Methacrylic-acid isobutyl, n-octyl methacrylate, methacrylic-acid dodecyl, 2-ethylhexyl methacrylate, stearyl methacrylate, methacrylic-acid phenyl, alpha-methylene aliphatic series monocarboxylic acid ester, such as dimethylaminoethyl methacrylate and diethylaminoethyl methacrylate; A methyl acrylate, An ethyl acrylate, acrylic-acid n-butyl, isobutyl acrylate, Acrylic-acid propyl, acrylic-acid n-octyl, acrylic-acid dodecyl, 2-ethylhexyl acrylate, acrylic-acid stearyl, acrylic-acid 2-KURORU ethyl, Acrylic ester, such as acrylic-acid phenyl; Vinyl methyl ether, Vinyl ether, such as vinyl ethyl ether and the vinyl isobutyl ether; A vinyl methyl ketone, Vinyl ketones; N-vinyl pyrroles, such as a vinyl hexyl ketone and a methyl isopropenyl ketone, N-vinyl compound; vinyl naphthalene, such as N-vinylcarbazole, N-vinyl indole, and N-vinyl pyrrolidone; there are vinyl system monomers, such as acrylic acids, such as acrylonitrile, a methacrylonitrile, and acrylamide, and a methacrylic-acid derivative.

[0022] The mean particle diameter is 20 micrometers or less, and the toner particle of the developer in this invention has a 3-12-micrometer desirable thing. These toner particles may be used as a 1 component developer, or may be used as a two component developer. When using it as a two component developer, as a carrier particle, volume mean particle diameter has desirable 20-120 micrometers, and its further 40-100 micrometers are desirable. The quality of the material of a carrier can use iron, nickel, cobalt, ferrous oxide, a ferrite, a glass bead, etc. Furthermore, what covered resin can be used for these particle front faces, and there is resin, such as methyl silicone, amine addition methyl silicone, phenyl silicon, acrylic modified silicone, a melamine bridge formation acrylic, and a fluoride acrylic, as the quality of the material.

[0023]

[Function] In this invention, at least one sort of non-subtlety particles are added among a metallic oxide, a metal nitride, metallic carbide, and a metal salt to the polymerization toner used as a developer. This particle achieves the duty as an adjuvant in the case of cleaning the imprint remaining toner on a photo conductor with a blade. Cleaning nature can be raised by adding this particle, without spoiling properties, such as the friability of a toner, and a fluidity. Even when the image formation equipment of this invention was used and many images are outputted by using the developer which consists of such a polymerization toner, it becomes possible to obtain the image of the stable quality.

[0024] Moreover, in the developer of this invention, about the thing to which the non-subtlety particle which consists of a metallic oxide was made to adhere, further, in order to improve the electrification nature, the addition of the particle per unit area on the front face of a toner was specified. The addition of a particle is  $0.5 \times 10^{-3}$  g/m<sup>2</sup>. When few, a fluid fall and fluid condensation of a toner occur. Moreover,  $50 \times 10^{-3}$  g/m<sup>2</sup> If many, the amount of electrifications will become high, and the rise of image concentration will take place. However, if it carries out within limits which specified the addition of the particle per unit area in this invention, problems, such as a rise of a fluid fall or fluid condensation of a toner, and image concentration, will not occur. Moreover, the increment in the amount of consumption toners can be pressed down. To high-definition-izing, although it is effective, in connection with this, as for furthermore making particle size of a toner small, specific surface area becomes large. If a particle is added in the amount specified in this invention even when this diameter-ization of a granule is performed, the above problems will not arise. Moreover, if adhesion immobilization is performed by giving heat and/or mechanical impulse force to a toner front face for a particle, the property can be stabilized further.

[0025]

[Example] Hereafter, an example is shown and the image formation equipment of this invention is shown concretely. The polymerization toner used for this invention is the following, and can be made and created.

[0026] First, converted the monomer mixture which consists of the styrene monomer 85 weight section, the butyl acrylate 15 weight section, and the acrylic-acid 3 weight section into the water-solution



mixture which consists of the water 100 weight section, the Nonion emulsifiability agent (emulgen 950) 1 weight section, the anion arrival-of-goods agent (neo gene R) 1.5 weight section, and the potassium persulfate 0.5 weight section, the polymerization reaction was made to perform at 70 degrees C under stirring for 8 hours, and resin Emma Lulu John was obtained.

[0027] Subsequently, this resin emulsion 100 weight section, the magnetite 1.5 weight section, and the carbon black 5 weight section are distributed to underwater [ containing the surface-active-agent (sodium dodecylbenzenesulfonate) 0.1 weight section ], and after converting diethylamine into this and adjusting pH to 5.5, preliminary mixing was carried out and it was made to distribute by the nano mizer.

[0028] Then, it heated at 90 degrees C, stirring further, and the hydrogen peroxide was added, the polymerization reaction was performed and the globular form primary particle toner with a particle diameter of 0.1-3 micrometers was obtained for 6 hours. By lowering the obtained primary particle toner to the temperature of 60 degrees C, and dropping the strength of stirring, it considered as the meeting object for which 2-3 primary particles gathered, it was again left at 90 degrees C for 6 hours, welding of the contact surface was carried out, and the secondary particle toner with a particle diameter of 3-15 micrometers was obtained.

[0029] After carrying out the vacuum drying of this secondary particle toner at 45 degrees C for 6 hours, to the secondary particle toner 100 weight section, the non-subtlety particle 0.5 weight section was converted, and the final polymerization toner was obtained.

[0030] Although the obtained polymerization toners are not globular forms since they are two or more meeting objects of the primary particle toner which is a globular form, they do not have a sharp crushing side like a grinding toner, and are covered on the curved surface.

[0031] The degree of sphericity of this polymerization toner is determined by the magnitude of a primary particle, the temperature at the time of welding, and time amount, and it decides on that suitable temperature and time amount according to the presentation of a toner. Generally the degree of sphericity of a toner can be expressed with specific surface area.

[0032] The specific surface area by the BET adsorption method was used as an index showing the particle shape of a toner. Particle shape becomes an indeterminate form, so that toner particle size is the same and specific surface area is large. As for a round thing, specific surface area becomes small relatively. Next, the image formation equipment of this invention is explained. Fig. 1 is a schematic diagram showing an example of the image formation equipment of this invention.

[0033] As shown in drawing, the electrification charger 2 is formed above a photoconductor drum 1, and an electrostatic latent image is formed in the photo conductor drum 1 uniformly charged with this electrification charger 2 by irradiating the reflected light 1 from a manuscript. This electrostatic latent image is developed by supplying the developer concerning this invention from the developing machine 3 formed by approaching the photo conductor drum 1. Furthermore, a developer image is imprinted on the conveyed paper 8 by the imprint charger 4 formed by approaching the photo conductor drum 1. The paper 8 in which the image was imprinted is fixed by the heating roller 7. On the other hand, the toner which remained on the photo conductor drum 1 is cleaned by the cleaner 5, and the electrified photo conductor drum 1 is discharged with the electric discharge lamp 6. Cleaning BURETO 9 is contacted by the photo conductor 1 in the cleaner 5.

[0034] Polyurethane rubber etc. is used as the quality of the material of a cleaning blade. It is required for a cleaning blade that abrasion resistance does not damage good things or a good photo conductor, that plastic deformation should be good, etc. next, this image formation equipment -- using -- many -- the result when outputting the image of several sheets is shown.

Example 1 [0035] It is CeO<sub>2</sub> as a cleaning adjuvant to the average volume particle size of 8 micrometers, and the polymerization toner 100 weight section of 1.7m<sup>2</sup> of BET specific surface areas / g. It is SiO<sub>2</sub> as the 0.50 sections and a fluid grant agent. The non-subtlety particle of the 0.65 sections was added using the Henschel mixer, the carrier made from a ferrite was mixed with this toner, and the two component developer was created.

The example 1 of a comparison [0036] A cleaning adjuvant is not added to the average volume particle

size of 8 micrometers, and the polymerization toner 100 weight section of 1.7m<sup>2</sup> of BET specific surface areas / g, but it is SiO<sub>2</sub> as a fluid grant agent. The non-subtlety particle of the 0.65 sections was added using the Henschel mixer, the carrier made from a ferrite was mixed with this toner, and the two component developer was created.

The example 2 of a comparison [0037] To the average volume particle size of 8 micrometers, and the polymerization toner 100 weight section of 3.2m<sup>2</sup> of BET specific surface areas / g, it does not add but a cleaning adjuvant is SiO<sub>2</sub> as a fluid grant agent. The non-subtlety particle of the 0.65 sections was added using the Henschel mixer, the carrier made from a ferrite was mixed with this toner, and the two component developer was created. The developer by the above three examples was put into the development counter of the above-mentioned image formation equipment, and the image of a total of 10,000 sheets was outputted. This result was shown in the table.

[0038]

[Table 1]

NO.	トナー 体積平均 粒径[μm]	トナー 比表面積 [m <sup>2</sup> /g]	SiO <sub>2</sub> 添加割合 [wt.%]	面積当り 添加量 [g/m <sup>2</sup> ]	画像 濃度	白抜け 画像	消費 トナー量 [g]
1	11	1.0	0.05	$0.5 \times 10^{-3}$	△	△	65
2	11	1.0	0.3	$3.0 \times 10^{-3}$	○	○	52
3	11	1.0	1.0	$10 \times 10^{-3}$	△	○	31
4	8	1.7	0.02	$0.1 \times 10^{-3}$	×	×	73
5	8	1.7	0.6	$3.5 \times 10^{-3}$	○	○	44
6	8	1.7	1.8	$10 \times 10^{-3}$	△	○	32
7	8	1.7	4.0	$28 \times 10^{-3}$	×	△	25
8	6	3.1	0.2	$0.6 \times 10^{-3}$	○	△	81
9	6	3.1	1.8	$5.8 \times 10^{-3}$	○	○	64
10	6	3.1	5.0	$16 \times 10^{-3}$	△	○	31
11	6	3.1	10.0	$32 \times 10^{-3}$	△	△	20
12	5	5.2	30.0	$57 \times 10^{-3}$	×	×	12

[0039] As shown in a table, in the example 1 of a comparison, the image which does not have a white omission after the output of an image of a total of 10,000 sheets was obtained, the problem of crushing did not have the number of very fine particle toners 4 micrometers or less fewer than 10%, and although it was good, as for cleaning nature, \*\*\*\* whose defect of cleaning is the cause appeared in the image after the 5000-sheet output. Although the defect of cleaning did not appear in the example 2 of a comparison, generating of a white omission and the increment in a very fine particle were seen. In the example 1, the result with good cleaning nature, white omission image, and toner friability was obtained.

[0040] the front face of a toner with the non-subtlety particle near a globular form added as a cleaning adjuvant -- \*\*\*\*\* -- it adheres like, he improves connection of the toner to a cleaning blade, and it is thought that poor cleaning is lost. The globular form toner to which such a non-subtlety particle has not

adhered cannot be easily caught in a cleaning blade, it passes through a blade, and it is thought that poor cleaning will occur.

[0041] A white omission image and toner friability were able to become good from the above result with particle shape with specific surface area like an example 1, and cleaning nature was able to be improved by adding the adjuvant of blade cleaning further.

The developer which changed the addition of a particle into the toner of several sorts of specific surface area was produced in the secondary example, and the image of a total of 10,000 sheets was outputted to it using the above-mentioned image formation equipment.

[0042] SiO<sub>2</sub> (product R-972 made from Japanese Aerosil) was used as a particle, using a hybridization system (made in the Nara machine factory) as an approach of adding a particle on a toner front face. OM DAIZA of a hybridization system NHS-O mold performs preliminary mixing on 1000rpm and the conditions for 1 minute, and it is this at 5000rpm and sufficient processing conditions in high BURIDAIZA SiO<sub>2</sub>. The toner front face was made to fix. In this way, it is SiO<sub>2</sub> when the produced toner was observed with the electron microscope. Having fixed on the toner front face was checked. In this example, three sorts of things, 11 micrometers, 8 micrometers, and 6 micrometers, are used for the volume mean particle diameter of a toner, and it is SiO<sub>2</sub> at each. The addition was changed and the toner was produced. In the output test of the image of a total of 10,000 sheets, change of image concentration, the condition of the white omission of a black solid image, and the amount of consumption toners were investigated. The result is shown in Table 2.

[0043] In addition, when O was maintaining 1.3 or more concentration until after the 10,000-sheet output from the early stages of a test in the image concentration of front Naka, concentration of \*\* was good the first stage, but when concentration falls, all x is the cases that concentration is low. When O generates generating nothing and less than ten \*\*s in the white omission image of front Naka, x is the case where a majority of ten or more pieces and a white omission occur. Here, observation of a white omission image outputted the black solid image of B4 size, and defined it as the number which observed and counted the white omission more than about 2mmphi in it visually. The amount of consumption toners was made into the near weight per 1000 images.

[0044]

[Table 2]

	実施例 1	比較例 1	比較例 2
クリーニング性	○	×	○
白 抜 け 画 像	○	○	×
トナー 破 碎 性	○	○	×

○…優、 ×…不良

[0045] As shown in Table 2, it is SiO<sub>2</sub> like a sample 4. Per area on the front face of a toner, when there were few additions than the range of this invention, a fluidity is bad, condensation of a toner took place, and the white omission occurred. Moreover, by the sample 4, the amount of electrifications of a toner is low, the amount of toners developed increases, and there are many amounts of consumption toners. On the other hand, it is SiO<sub>2</sub> like a sample 12. When there were more additions than the range of this invention, although there are few amounts of consumption toners, its amount of electrifications is high, the fall of image concentration has taken place, and there was an inclination out of which a white omission tends to come in connection with this.

[0046] An addition is  $0.5 \times 10^{-3}$  to  $50 \times 10^{-3}$  g/m<sup>2</sup> per area on such a result to the front face of a toner. It is good and is further  $1.0 \times 10^{-3}$  -  $20 \times 10^{-3}$  g/m<sup>2</sup>. It turns out that the range is desirable.

[0047]

[Effect of the Invention] using the developer which contains the polymerization toner which added the non-subtlety particle as an adjuvant of cleaning according to this invention as explained above -- many - it becomes image-formation equipment which can be obtained by the thing of the image quality which poor cleaning did not occur even when the image of several sheets was outputted, and properties, such as the friability of a toner and a fluidity, do not have a disadvantage crack, either, made, and was stabilized.

[0048] moreover, the time of adding the particle which becomes a toner front face from a metallic oxide -- the addition of the particle per unit area on the front face of a toner --  $0.5$  to  $10^{-3}$  -  $50 \times 10^{-3}$  g/m<sup>2</sup> adding so that it may become the range -- many -- also when the image of several sheets is outputted, it becomes the toner for electrophotography with which the image quality stabilized further is acquired. Moreover, if adhesion immobilization is performed by giving heat and/or mechanical impulse force to a toner front face for a particle, the property can be stabilized further.

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[Translation done.]

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*not disclosing "... in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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CLAIMS

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[Claim(s)]

[Claim 1] The particle for photo conductor surface coating characterized by containing the almost globular form silica particle by the deflagrating method.

[Claim 2] The image-formation approach characterized by coming to supply [ a photo conductor front face ] the powder which contains the almost globular form silica particle by the deflagrating method except a development field in the image-formation approach of having the process which develops the electrostatic latent image on an electrostatic latent-image supporter, the process which imprints the formed toner image to an imprint member, and the process which removes the developer component which remains on an electrostatic latent-image supporter.

[Claim 3] The image formation approach according to claim 2 that the process which removes a developer component is characterized by using a brush and/or a blade and making the powder containing the almost globular form silica particle by the deflagrating method come to adhere to this brush and/or at least one member of a blade.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to an electrophotography photo conductor front face and/or the particle for cleaning member covering.

[0002]

[Description of the Prior Art] After a xerography's developing the electrostatic latent image formed in the photo conductor etc. using a developer and imprinting the toner on a photo conductor to imprint material, such as paper and a sheet, it is established using heat, a solvent, a pressure, etc., a permanent image is obtained, and the toner which remained on the photo conductor at that time is cleaned.

Therefore, it faces copying, and each process is completed as a system with a stable repeat property only after it functions completely. Cleaning nature with a cleaning process higher than we may cause the photo conductor damage on a blemish, wear, etc. on the front face and are anxious about generating of the image quality defect by poor cleaning etc. on the other hand since a photo conductor, a cleaning member, etc. contact directly is especially needed among the above-mentioned processes. Outside \*\* to the toner of various assistants, such as non-subtlety powder, such as a silica, a fatty acid, its metal salt and those derivatives, and polyolefine, is proposed in order to fill these the demands of many, and the improvement of a fluidity, endurance, or cleaning nature is achieved.

[0003]

[Problem(s) to be Solved by the Invention] However, in the additive by which the conventional proposal is made, although inorganic compounds, such as a silica, a titania, and an alumina, raise a fluidity remarkably, they have problems -- a crater and a blemish tend to attach a photo conductor surface layer with hard inorganic compound fines, and it is easy to produce toner fixing in the part which got damaged. Moreover, although use of recycled paper is increasing for the purpose of saving-resources-izing in recent years, generally, there is a problem of generating many paper powder, paper powder etc. enters between a photo conductor and a blade, and recycled paper induces poor cleaning, such as a black line.

[0004] External addition of a fatty-acid metal salt (JP,60-198556,A), polyolefine (JP,61-231562,A and 61-231563 official report), etc. is considered as an additive that these problems should be solved. In what was indicated by the above-mentioned official report, the particle size of an additive is all as large as 3-20 micrometers, and in order to make the effectiveness discover efficiently, addition of a considerable amount is needed. If it furthermore adds, although it is effective in first stage, the problem of the film formation as lubricant not being uniform and making an image generate a white omission, image dotage, etc. according to filming original with an additive (lubricant) arises. Moreover, on the other hand, covering (JP,2-3188,B) of independent or the photo conductors by the impalpable powder of a copolymer, such as an acrylic ester monomer, a methacrylic ester monomer, and a styrene system monomer, is considered. However, recently, it tends to accelerate more and the stress (a load, rate) which starts a photo conductor in connection with it at the time of cleaning also increases a copy rate. Therefore, the above resin system impalpable powder deforms for the stress at the time of cleaning, and

generates problems, such as filming. Furthermore, there is a fault point that the polarity of the photo conductor used for the electrification polarity which resin itself has is also limited.

[0005] Therefore, this invention is made in view of the above-mentioned actual condition of the conventional technique. That is, the purpose of this invention does not damage a photo conductor front face in a cleaning process, does not cause a filming phenomenon etc. to a photo conductor front face or an electrification grant member front face, but is to offer the photo conductor front face and/or the particle for cleaning member covering which can remove a residual toner.

[0006]

[Means for Solving the Problem] this invention person etc. came to complete a header and this invention for the ability of the above-mentioned purpose to be attained by covering a photo conductor front face and/or a cleaning member with an almost globular form silica particle, as a result of inquiring wholeheartedly.

[0007] That is, this invention is in the particle for photo conductor surface coating containing an almost globular form silica particle. This invention is in the image formation approach which supplies the powder containing the silica particle of almost the globular form in except for a development field to a photo conductor front face in the image formation approach of having the process which develops the electrostatic latent image on an electrostatic latent-image supporter, the process which imprints the formed toner image to an imprint member, and the process which removes the developer component which remains on an electrostatic latent-image supporter again. As for the process which removes a developer component, in the above-mentioned image formation approach, it is desirable to make the powder which contains an almost globular form silica particle in the at least one member using a brush and/or a blade adhere.

[0008] Hereafter, this invention is explained to a detail. The almost globular form silica particle (only henceforth a globular form silica particle) of 300 or more g/l of bulk density can be used for the photo conductor front face and/or the particle for cleaning member covering concerning this invention. The silica particle of 300 or more g/l of bulk density can be obtained by the deflagrating method. As for the silica particle by the deflagrating method, a reaction rate is generated by the rapid combustion reaction about hundreds of m or less per second in silicon and oxygen. Generally, this silica particle presents the shape of a true ball with a smooth front face, and a consistency is 3 2.1mg/mm. It becomes the above.

I) Although that whose ratio of the minor axis/major axis of the circle of a projection image is 0.8 or more was desirable in configuration observation this invention and that whose ratio is 0.9 or more further was especially used preferably from the SEM photograph, when asked for the ratio of the minor axis/major axis of the circle of a projection image, all are 0.90 or more and were presenting the globular form.

II) True degree of sphericity of Wadell [several 1]

球形状  $\Psi = \frac{\text{実際の粒子と同じ体積を有する球の表面積}}{\text{実際の粒子の表面積}} \dots (1)$

$\dots (2)$

(1): It asked by count from mean particle diameter.

(2): The BET specific surface area was made to substitute using Shimazu fine-particles specific-surface-area measuring device SS-100 form.

In this invention, the degree of sphericity  $\Psi$  could use 0.6 or more things, and especially, although it was 0.8 or more things preferably, when asked for the degree of sphericity  $\Psi$  of the used globular form silica particle from the above-mentioned formula, it was checked that all are 0.80 or more.

[0009] With the property of being hard to deform firmly, the silica particle itself does not generate filming on a photo conductor in the case of the cleaning under high stress (a high load, high speed, etc.), since the above-mentioned globular form silica particle is a globular form, it plays the role of the koro, and it functions as an interaction reduction agent of a cleaning blade and a photo conductor. since [ moreover, ] there is little impact given to electrification -- forward and negative -- it is usable to any polar photo conductor. A 0.05-3.0-micrometer thing is usually used, and the range of the first [ an

average of ] particle size (henceforth mean particle diameter) of a globular form silica particle is 0.1-1.0 micrometers preferably. A globular form silica particle will be buried in a part for the crevice of the irregularity on the front face of a toner as it is less than 0.05 micrometers, and the role of the koro, i.e., a role of an interaction reduction agent, will be reduced. On the other hand, when larger [ than 3.0 micrometers ] and a globular form silica particle is located between a blade and a photo conductor front face, the toner particle which should be cleaned is passed, namely, there is a fault of generating poor cleaning.

[0010] The web to which the particle was put into BAUCHI made of small sheeting (small bag) that what is necessary is just to supply from the outside in order to make a photo conductor front face cover the globular form silica particle of this invention, and dusting was performed to the cleaning member or the photo conductor by hand, or the particle adhered, a sponge roll, etc. are installed before a cleaning member, and covering of a particle should just be formed on a photo conductor at stability at the time of cleaning. Moreover, covering of a particle should just be formed on a photo conductor at stability because a cleaning process makes a particle adhere to either or the both sides of a brush or a blade when using together, either brush cleaning and blade cleaning and.

[0011] In the xerography using such a particle, although the 2 component toner with which the target toner uses binding resin and a coloring agent as an indispensable component, the magnetic monocomponent toner which connotes a magnetic material, or a capsule toner does not receive a limit at all, as for especially the mean particle diameter, it is desirable to set it as the range of 3-20 micrometers 30 micrometers or less. Moreover, especially if the carrier used when a toner is used as a two component developer is well-known, it is not restricted, and an iron powder system carrier, a ferrite system carrier, a surface coat ferrite system carrier, a magnetic powder distributed carrier, etc. can be used for it. Moreover, well-known things, such as what gave the overcoat to a selenium system photo conductor, an organic system photo conductor, amorphous silicon photo conductors, or these front faces as electrostatic latent-image support if needed, are conventionally usable. All can be used if it is a 2 component developing machine conventionally well-known also as a developing machine, or a 1 component developing machine. Anythings can be used if it is the cleaning method by blade sticking by pressure, the fur brush cleaning method, and other well-known things as a cleaning means to remove the toner which remained on the photo conductor.

[0012] Although the particle for photo conductor surface coating of this invention can be suitably used according to a dry type process, after it generally visualizes an electrostatic latent image with the developer in a developing machine after it forms an electrostatic latent image on electrostatic latent-image support, such as electrophotography and electrostatic recording, and it imprints a visible image to another support, it can be used for the process of cleaning the toner which remains on electrostatic latent-image support.

[0013]

[Example] Although an example and the example of a comparison are hung up and this invention is explained concretely hereafter, this invention is not limited to these examples. Moreover, in the following explanation, all the "sections" means the "weight section." In addition, the bulk density of the globular form silica particle and colloidal silica which were used in the example 1 and the example 4 of a comparison, respectively was measured by the following approach. Using the 100ml measuring cylinder, the silica particle was added gradually and it was made 100ml. Vibration was not given at that time. Bulk density was measured according to the weight difference before and after putting in the silica of this measuring cylinder.

Bulk density (g/l.) = amount (g/100ml) of silicas x10  
 example 1 Binding resin [a styrene-butyl acrylate copolymer (80/20)] The 100 sections Carbon black (R330: Cabot Corp. make) The ten sections Low molecular weight polypropylene (P: bis-call 660 Mitsuhiro formation shrine make) The five sections Electrification control agent (P-51: the ORIENT chemical-industry company make) Melting kneading of the 2 section above-mentioned component was carried out with the Banbury mixer, and it pulverized with the jet mill after cooling, it classified with the classifier, and the toner particle with a mean particle diameter of 11 micrometers was obtained. The titanium-dioxide particle 2 section of 0.05 micrometers



of mean diameters was added to this toner 100 section, with the Henschel mixer, distributed mixing was carried out and the toner was prepared.

[0014] To a degree Styrene-methacrylic-acid butyl copolymer (70/30) The 100 sections Magnetite (EPT-1000: Toda Kogyo Corp. make) The 200 sections Polyvinylidene fluoride (product made from KYNAR:Penn Walt) Melting kneading of the five sections was carried out with the pressurized kneader, it ground using the turbo mill and the classifier further, the classification was performed, and the carrier with a mean particle diameter of 50 micrometers was obtained. The toner 5 above-mentioned section and this carrier 95 section were mixed, and the two component developer constituent was prepared. And by performing dusting on the photo conductor front face of a Vivace800 (Fuji Xerox make) reconstruction machine using BAUCHI (small bag made of sheeting) which connoted the globular form silica particle (about 575g [l. ] bulk density) (KMP-105: the Shin-etsu chemistry company make) with a mean particle diameter of 0.7 micrometers, this particle was made to adhere and the copy test was performed using the above-mentioned developer.

[0015] The copy test was performed like the example 1 except having made the globular form silica particle adhere to a cleaning brush instead of the photo conductor front face of an example 2Vivace800 (Fuji Xerox make) reconstruction machine.

[0016] The copy test was performed like the example 1 except having made the globular form silica particle adhere to a cleaning blade instead of the photo conductor front face of an example 3Vivace800 (Fuji Xerox make) reconstruction machine.

[0017] The copy test was performed like the example 1 except having made the globular form silica particle adhere to a cleaning brush and a cleaning blade instead of the photo conductor front face of an example 4Vivace800 (Fuji Xerox make) reconstruction machine.

[0018] By performing dusting using the pouch which connoted the example 5 globular-form silica particle, the globular form silica particle was made to adhere to the photo conductor of a Vivace800 (Fuji Xerox make) reconstruction machine, and the copy test was further performed like the example 1 except having made the globular form silica particle adhere also to a cleaning brush and a cleaning blade.

[0019] The copy test was performed like the example 1 except having not made a globular form silica particle adhere to the photo conductor front face of an example of comparison 1Vivace800 (Fuji Xerox make) reconstruction machine.

[0020] The copy test was performed like the example 4 except having made the methyl-methacrylate-styrene copolymer (50/50) particle of 0.5 micrometers of mean diameters adhere to example of comparison 2 cleaning brush, and a cleaning blade.

[0021] The copy test was performed like the example 4 except having made the polyvinylidene fluoride particle (product made from KYNAR:Penn Walt) of 0.3 micrometers of mean diameters adhere to example of comparison 3 cleaning brush, and a cleaning blade.

[0022] The copy test was performed like the example 4 except having made the colloidal silica particle (R972: product made from Japanese Aerosil) by the method of hydrolyzing 16nm of mean diameters adhere to example of comparison 4 cleaning brush, and a cleaning blade. In addition, the bulk density of the colloidal silica by the usual hydrolyzing method is in the range of 50 - 200 g/l, and used the thing of bulk density about 50 g/l in this example of a comparison.

[0023] the result obtained from the copy test of stiffness is shown in Table 1. Moreover, a test method and the valuation basis are as follows.

1) About the black obi of cleaning engine-performance the width of face of 5cm, blade cleaning of 999 sheet mode x3 time was performed in the state of un-imprinting. This evaluation is a stress test and poor cleaning usually generates it in G4-G5 satisfactory at G1 - G3 at the time of a copy at the time of a copy.

G1: The toner on the front face of a photo conductor was able to be cleaned satisfactory.

When it became more than G2:2500 sheet and it, PUAURININGU occurred a little.

G3: PUAURININGU occurred in the 1500 sheet -2499 sheet.

PUAURININGU occurred in the G4:500 sheet -1499 sheet.

PUAKURININGU occurred less than [ G5:499 sheet ].

2) After extracting a 100,000 sensitized material abrasion loss copy, the abrasion loss of a photo conductor was measured.

3) The 100,000 image quality defective copy was extracted and the image quality of a copy and the defect on the front face of a photo conductor were observed.

: [ Problem-less ] The blemish on image quality defects, such as a sunspot, a black line, and fogging, and the front face of a photo conductor was not observed between 100,000-sheet copy extraction and after the 100,000-sheet copy.

\* The sunspot by the black line and photo conductor blemish which originate in poor cleaning from 1:800-sheet copy extent occurred.

\* The black line by filming occurred from 2:1000-sheet copy extent.

\* The sunspot by the black line and photo conductor blemish which originate in poor cleaning from 3:200-sheet copy extent occurred.

[0024]

[Table 1]

	感剤表面添加剤 (粒子径)	ブレード添加剤 (粒子径)	ブラシ添加剤 (粒子径)	クリーニング 性 能 (Grade)	感材磨耗量 ( $\mu\text{m}$ )	画質欠陥
実施例 1	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	—	—	G2	<1.0	問題なし
実施例 2	—	—	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	G3	1.0	問題なし
実施例 3	—	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	—	G2	4.0	問題なし
実施例 4	—	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	G1	<1.0	問題なし
実施例 5	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	球形シリカ微粒子 ( $0.7\mu\text{m}$ )	G1	<1.0	問題なし
比較例 1	—	—	—	G5	30	*1
比較例 2	—	—	タタリ酸シリル/スリル共重合体微粒子 ( $0.5\mu\text{m}$ )	G4	10	*2
比較例 3	—	—	ポリフッ化ビニリデン微粒子 ( $0.3\mu\text{m}$ )	G3	— (注1)	— (注1)
比較例 4	—	—	加水分解法シリカ微粒子 ( $0.016\mu\text{m}$ )	G5	35	*3

(注1) : 初期画像でカブリが発生し画像濃度が上がらないため、この部分は評価試験が行えなかった。

[0025]

[Effect of the Invention] The photo conductor front face of this invention, and/or the particle for cleaning member covering A globular form silica particle and the globular form silica particle (mean particle diameter: 0.5-3.0 micrometers) manufactured by the deflagrating method especially by making it adhere to a photo conductor front face and/or a cleaning member the -- true -- with the property of being hard to deform spherically and firmly, a photo conductor front face is not damaged in a cleaning process, a filming phenomenon etc. is not caused to a photo conductor front face or an electrification grant member front face, and it functions as an interaction reduction agent in the case of removal of a residual toner.

[Translation done.]

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*not disclosing "in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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CLAIMS

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[Claim(s)]

[Claim 1] Make the development roll which supports the developer layer charged in the same polarity as the latent-image charge of photo conductor drum lifting counter a photo conductor drum, and it is arranged. It is the nonmagnetic 1 component developer used in the development approach which carries out suction removal and cleans the residual developer which has adhered to the non-latent-image field of a photo conductor drum at the same time it development-izes the latent-image field of a photo conductor drum to a development roll side. This nonmagnetic 1 component developer including binding resin and a coloring agent in the range whose (a) volume mean particle diameter (dv) is 5-15 micrometers (b) The range of the ratio (dv/dn) of volume mean particle diameter (dv) and number mean particle diameter (dn) is 1.00-1.40. (c) The value (Sc/Sr) which broke by real projected area (Sr) of a particle the area (Sc) of the circle of a particle which made maximum length the diameter absolutely The range of 1.00-1.30, The product (AxdnxD) of the specific surface area (A) by the (d) BET adsorption method, (m<sup>2</sup>/g), number mean particle diameter (dn) (micrometer), and true specific gravity (D) substantially [ the range of 5-10 ] and in a globular form Furthermore, the nonmagnetic 1 component developer characterized by the ratio (Q/A) of the amount of (e) electrifications (Q), (muc/g), and specific surface area (A) being in the range of 80-150.

[Claim 2] The nonmagnetic 1 component developer according to claim 1 which is made to carry out the polymerization of the homogeneity mixed liquor containing a vinyl system monomer and a coloring agent by the suspension-polymerization method, and obtains it.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to amelioration of the nonmagnetic 1 component developer used in the development approach which cleans to development and coincidence in electrophotography equipment or electrostatic recording equipment.

[0002]

[Description of the Prior Art] Generally the image formation equipment which images the predetermined latent image of photo conductor drum lifting, such as electrophotography equipment and electrostatic recording equipment, is equipped with the cleaning equipment for removing the residual developer of photo conductor drum lifting.

[0003] For example, generally the image formation equipment of a configuration as cross-section schematic drawing is shown in drawing 1 is used. In this equipment, cleaning equipment (2) equipped with the cleaning blade (2a) arranged around a photo conductor drum (1) and this photo conductor drum (1), electrification equipment (3), an aligner (4), a developer (5), a development roll (8), imprint equipment (6), etc. are formed. Selection exposure is performed by the aligner (4) and, as for the front face of a photo conductor drum (1) where necessary electrification was performed by electrification equipment (3), a latent image is formed. A latent-image field is developed by the developer (toner) using a developer (5). The developed toner image is imprinted by the transfer paper (7) with imprint equipment (6). The toner which remained to photo conductor drum lifting is removed by the cleaning blade (2a) of cleaning equipment (2) after an imprint process.

[0004] However, in the above-mentioned equipment, in order to have to discard the residual toner accumulated into cleaning equipment, there is a problem that a maintenance is complicated and moreover causes contamination of an equipment perimeter and an environment. Moreover, a photo conductor drum is worn out by friction with a cleaning blade, and the fall of an image formation property or a life arises. Furthermore, installation of cleaning equipment reduces the degree of freedom on the design of image formation equipment.

[0005] In order to solve such a problem, the approach use a 1 component developer and the same developer performs development and cleaning to coincidence is proposed (JP,62-203182,A, JP,3-7972,A). The cross-section schematic drawing of an example of such image formation equipment is shown in drawing 2 R> 2. In addition, among drawing 2, a sign (9) is toner thickness specification-part material, and other signs show the member or equipment which corresponds with drawing 1.

[0006] In the approach of performing development and cleaning to coincidence using the equipment shown in drawing 2, the following principles recover the residual toner of photo conductor drum lifting after an imprint process in a developer. That is, set to  $V_b$  development bias voltage to which the surface potential of  $V_o$  and the exposure section (latent-image field) is impressed for the surface potential of the unexposed section (non-latent-image field) of a photo conductor drum (1) by  $V_q$  and the development roll (8), and let surface potential  $V_e$  of a development roll (8) be said development bias voltage  $V_b$  and equal. Reversal development of the electrostatic latent image of photo conductor drum lifting is carried

out by the 1 component developer (toner) charged in the same polarity as a latent-image charge. [0007] In this reversal development, each above-mentioned surface potential is set up so that the relation of  $|V_o| > |V_e| > |V_q|$  may be filled (however,  $V_o$ ,  $V_e$ , and  $V_q$  like-pole nature). In the latent-image field of a photo conductor drum, the force to the direction of a photo conductor drum by potential difference  $|V_e - V_q|$  works to the toner on a development roll, and development is performed. After an imprint process, to the toner which remained to the non-latent-image field, the force to the development roll direction by potential difference  $|V_o - V_e|$  works, and recovery of a residual toner, i.e., cleaning, is performed. According to this coincidence development / cleaning approach, conventional cleaning equipment becomes unnecessary.

[0008] Moreover, it is thickness uniform on a development roll (8), and a thin toner layer is made to form by toner thickness specification-part material (9) by this development approach. Furthermore, as a toner, the big nonmagnetic 1 component developer of specific resistance which does not contain magnetic powder is used including binding resin and a coloring agent.

[0009] However, if potential difference  $|V_e - V_q|$  is enlarged in order to obtain image concentration sufficient by said approach according to this invention persons' experimental result, potential difference  $|V_o - V_e|$  for residual toner recovery will become small, cleaning will become imperfect, and a ghost image will appear. If potential difference  $|V_o - V_e|$  is enlarged in order to improve cleaning nature, since potential difference  $|V_e - V_q|$  required for development becomes small, satisfactory image concentration will no longer be obtained. And while controlling each above-mentioned surface potentials  $V_o$ ,  $V_e$ , and  $V_q$  proper in order to satisfy image concentration and cleaning nature when [ that the imprint nature to the transfer paper of the toner of photo conductor drum lifting is bad / both ] there are many residual toners, it is necessary to control the speed ratio of the toner thickness formed on a development roll and a photo conductor drum, and a development roll, and to lessen the amount of toners which remains after an imprint by keeping the amount of development of a toner proper. However, such proper condition width of face is very narrow, and proper control is difficult for it.

[0010]

[Problem(s) to be Solved by the Invention] The purpose of this invention is in the development approach which cleans to development and coincidence to offer the improved nonmagnetic 1 component developer to which both image concentration and cleaning nature can be satisfied. In the development approach which cleans to development and coincidence, this invention persons found out that the conventional nonmagnetic 1 component developer was inadequate, in order to satisfy both image concentration and cleaning nature. And as a result of inquiring wholeheartedly, it found out giving the good image which excels [ developer / which has specific physical properties / which consists of a globular form particle substantially / nonmagnetic 1 component ] in imprint nature, it cleans effectively the toner which remained to development and coincidence at photo conductor drum lifting, and does not have a ghost image.

[0011] If this improved nonmagnetic 1 component developer is used, imprint effectiveness becomes high and each proper condition width of face larger than before can be taken about the speed ratio of said each surface potentials  $V_o$ ,  $V_e$ , and  $V_q$ , the toner thickness formed on a development roll and a photo conductor drum, and a development roll. This invention comes to be completed based on these knowledge.

[0012]

[Means for Solving the Problem] Make the development roll which supports the developer layer charged in the same polarity as the latent-image charge of photo conductor drum lifting in this way according to this invention counter a photo conductor drum, and it is arranged. It is the nonmagnetic 1 component developer used in the development approach which carries out suction removal and cleans the residual developer which has adhered to the non-latent-image field of a photo conductor drum at the same time it development-izes the latent-image field of a photo conductor drum to a development roll side. This nonmagnetic 1 component developer including binding resin and a coloring agent in the range whose (a) volume mean particle diameter ( $dv$ ) is 5-15 micrometers (b) The range of the ratio ( $dv/dn$ ) of volume mean particle diameter ( $dv$ ) and number mean particle diameter ( $dn$ ) is 1.00-1.40. (c) The value ( $Sc/Sr$ )

which broke by real projected area ( $S_r$ ) of a particle the area ( $S_c$ ) of the circle of a particle which made maximum length the diameter absolutely The range of 1.00-1.30. The product ( $A \times d_n \times D$ ) of the specific surface area ( $A$ ) by the (d) BET adsorption method, ( $m^2/g$ ), number mean particle diameter ( $d_n$ ) (micrometer), and true specific gravity ( $D$ ) substantially [ the range of 5-10 ] and in a globular form Furthermore, the nonmagnetic 1 component developer characterized by the ratio ( $Q/A$ ) of the amount of (e) electrifications ( $Q$ ), ( $\mu c/g$ ), and specific surface area ( $A$ ) being in the range of 80-150 is offered. [0013] In <measuring method of physical properties> this invention, the measuring method and measuring device of physical properties of a developer are as follows.

(1)  $S_c/S_r$  is the value which measured on condition that the following with image-processing analysis equipment, and was analyzed.

Image-processing analysis equipment: Roux ZEKKUSU IID [Product made from NIKORE]

The rate of area of the particle to frame area: Max Total 2% processing particle number: 1000 pieces (the number average of 1000 pieces shows a  $S_c/S_r$  value.)

(2) The specific surface area ( $A$ ) by the BET adsorption method is the value measured using the Shimadzu specific-surface-area automatical measurement equipment 2200 mold.

(3) A volume mean diameter ( $d_v$ ) and a number mean diameter ( $d_n$ ) are the values measured with the Coulter counter [a model TA-II mold and the product made from Department Machine of a Day].

(4) True specific gravity ( $D$ ) is the value measured with the Beckmann aerometer.

(5) After the amount of electrifications ( $Q$ ) and ( $\mu c/g$ ) mix a toner so that it may become a carrier TEFV 150/250 with 5% of concentration, and they agitate it for 30 minutes by 150rpm rotations, they are the value measured by the blowing off method.

[0014] Hereafter, this invention is explained in full detail. Conventionally, the toner carried out melting kneading of the mixture which generally contains binding resin and a coloring agent, and after cooling subsequently, it was preparing it by grinding and classifying with a grinder and arranging particle size. Generally the value ( $S_c/S_r$ ) into which the toner obtained by such grinding method is an indeterminate form, and particle shape divided by real projected area ( $S_r$ ) of a particle the area ( $S_c$ ) of the circle of a particle which made maximum length the diameter absolutely exceeds 1.3. Moreover, the specific surface area ( $A$ ) by the BET adsorption method becomes large, and the value of the product ( $A \times d_n \times D$ ) of specific surface area ( $A$ ), ( $m^2/g$ ), number mean particle diameter ( $d_n$ ) (micrometer), and true specific gravity ( $D$ ) exceeds 10.

[0015] since the toner with the above configurations and a property have the imprint effectiveness as low as 60 - 90% to a transfer paper when it be use as a developer in the development approach which clean to said development and coincidence, said each surface potentials  $V_o$ ,  $V_e$ , and  $V_q$  for satisfy both image concentration and cleaning nature, the toner thickness form on a development roll, and the proper condition width of face of the speed ratio of a photo conductor drum and a development roll become very narrow.

[0016] On the other hand, this invention persons are the range whose volume mean particle diameter ( $d_v$ ) is 5-15 micrometers. The range of the ratio ( $d_v/d_n$ ) of volume mean particle diameter ( $d_v$ ) and number mean particle diameter ( $d_n$ ) is 1.00-1.40. The value ( $S_c/S_r$ ) which broke by real projected area ( $S_r$ ) of a particle the area ( $S_c$ ) of the circle of a particle which made maximum length the diameter absolutely The range of 1.00-1.30, The product ( $A \times d_n \times D$ ) of the specific surface area ( $A$ ) by the BET adsorption method, ( $m^2/g$ ), number mean particle diameter ( $d_n$ ) (micrometer), and true specific gravity ( $D$ ) substantially [ the range of 5-10 ] and in a globular form Furthermore, when the ratio ( $Q/A$ ) of the amount of electrifications ( $Q$ ), ( $\mu c/g$ ), and specific surface area ( $A$ ) used the nonmagnetic monocomponent toner in the range of 80-150 as a developer in said development / cleaning approach, it found out that imprint effectiveness improved with 90 - 99%.

[0017] If the particle with which are not satisfied of the aforementioned shape factor ( $S_c/S_r$ ) and the conditions of a product ( $A \times d_n \times D$ ) is used as a toner, imprint effectiveness will be low, image concentration will be inadequate, and natural complexion dirt, image nonuniformity, and a ghost image will occur. In the nonmagnetic toner with which volume mean particle diameter ( $d_v$ ) exceeds less than 5 micrometers or 15 micrometers, equalization of the toner layer on a development roll is not obtained, or



imprint effectiveness worsens and sufficient image concentration is not obtained.

[0018] In a large thing, it will become unstable [ toner supply ] at the time of long-term continuation development very [ particle size distribution to which the ratio (dv/dn) of volume mean particle diameter (dv) and number mean particle diameter (dn) exceeds 1.40 ]. dv/dn is 1.00-1.25 preferably. When the ratio (Q/A) of the amount of electrifications (Q), (muc/g), and specific surface area (A) uses the toner exceeding less than 80 and 150, sufficient image concentration will not be obtained or it will become an image with much natural complexion dirt. (Q/A) is 90-140 preferably.

[0019] Therefore, if this toner is used, said each surface potentials Vo, Ve, and Vq for satisfying both image concentration and cleaning nature, the toner thickness formed on a development roll, and the large proper condition width of face of the speed ratio of a photo conductor drum and a development roll can be taken.

[0020] The polymerization of the homogeneity mixed liquor containing a vinyl system monomer and a coloring agent can be carried out by the suspension-polymerization method, and the nonmagnetic monocomponent toner of this invention can obtain it. For example, homogeneity is made to distribute a vinyl system monomer, a coloring agent, a radical polymerization initiator, and the mixture that contains various additives etc. by request with a ball mill etc. as a concrete suspension-polymerization method, homogeneity mixed liquor is prepared, and the approach of usually carrying out a suspension polymerization at the temperature of 30-200 degrees C is mentioned as a water dispersion which, subsequently to underwater, detailed--ization-distributed this homogeneity mixed liquor by high shear churning.

[0021] As a vinyl system monomer used here, for example Styrene, vinyltoluene, Styrene system monomers, such as alpha methyl styrene; An acrylic acid, a methacrylic acid, A methyl acrylate, an ethyl acrylate, acrylic-acid propyl, butyl acrylate, 2-ethylhexyl acrylate, methacrylic acid ethyl, methacrylic-acid propyl, Methacrylic-acid butyl, 2-ethylhexyl methacrylate, dimethylaminoethyl methacrylate, The derivative of acrylic acids, such as acrylonitrile and acrylamide, or a methacrylic acid; Ethylene, ECHIEN nature partial saturation monoolefins, such as a propylene and a butylene; A vinyl chloride, Vinyl ester, such as halogenation vinyl; vinyl acetate, such as a vinylidene chloride and a fluoride building, and propionic-acid vinyl; Vinyl methyl ether, Vinyl ether, such as vinyl ethyl ether; nitrogen-containing vinyl compounds, such as vinyl ketone; 2-vinylpyridines, such as a vinyl methyl ketone and a methyl isopropenyl ketone, 4-vinylpyridine, and N-vinyl pyrrolidone, etc. are mentioned. These vinyl system monomers are independent, respectively, or can be used combining two or more sorts of monomers.

[0022] The cross linking agent of arbitration can be used with these vinyl system monomers. As a cross linking agent, divinyl compounds, such as diethylene nature unsaturated-carboxylic-acid ester; N, such as aromatic series divinyl compound; ethylene glycol dimethacrylate, such as a divinylbenzene, divinyl naphthalene, and its derivative, and diethylene-glycol dimethacrylate, N-divinyl aniline, and the divinyl ether, and the compound which has three or more vinyl groups can be mentioned, for example. These cross linking agents can be used combining independent or two sorts or more.

[0023] As a coloring agent used for this invention, pigments, such as carbon black, aniline black, a crystal violet, Rhodamine B, Malachite Green, Nigrosine, a copper phthalocyanine, and azo dye, and a color can be mentioned, for example. These coloring agents are independent, respectively, or can be combined two or more sorts and can be used.

[0024] furthermore, the strong polar matter called an electrification control agent in these fields, such as a Nigrosine color, monoazo color, metallized dye, zinc hexadecyl succinate, alkyl ester [ of a naphthoic acid ] or alkylamide, nitro-humic-acid, N, and N'-tetramethyl diamine benzophenone, N, and N'-tetramethyl benzidine, triazine, and a salicylic-acid metal complex, -- one sort -- or two or more sorts may be made to contain

[0025] Moreover, the additive for controlling the adhesion to electrification nature, conductivity, a fluidity, a photo conductor, or a fixing roll can be made to \*\* content or outside to the nonmagnetic toner of this invention. As such an additive, non-subtlety powder, such as release agents, such as low molecular weight polypropylene, low molecular weight polyethylene, various waxes, and silicone oil,

carbon black, a silica, an alumina, titanium oxide, a zinc oxide, cerium oxide, and a calcium carbonate, etc. is mentioned, for example.

[0026]

[Example] Although an example and the example of a comparison are given to below and this invention is concretely explained to it, this invention is not limited only to these examples. Moreover, in the following examples, the section and % are weight criteria, as long as there is no notice especially.

[0027] Ball mill distribution of the [example 1] styrene 90 section, stearyl methacrylate 10 section, low-molecular-weight-polypropylene 4 section, carbon black (trade name black pearl 130) 7 section, chromium system color (trade name BONTORON S-34) 0.5 section and 2, and 2'-azobis (2,4-dimethylvaleronitrile) 2 section was carried out, and homogeneity mixed liquor was obtained.

[0028] Next, the above-mentioned mixed liquor was added in the pure-water 350 section which distributed the calcium phosphate 3 section minutely, and the water dispersion was obtained. A rotor stator mold homomixer performs high shear churning for this water dispersion under with a pH of nine or more conditions, the above-mentioned mixed liquor was underwater made detailed, and it was made to distribute it. This water dispersion was put into the reactor to which the impeller was attached, and the polymerization was performed to the bottom of churning at 65 degrees C for 4 hours.

[0029] Thus, it dissociated and the dispersion liquid containing the obtained polymer were dried, after fully performing acid cleaning and backwashing by water, and the toner ingredient was obtained. In the toner ingredient 100 above-mentioned section, the hydrophobic silica 0.3 section was \*(ed) outside as a plasticizer, and nonmagnetic monocomponent toner was obtained in it. The obtained nonmagnetic monocomponent toner was the particle of a globular form [ target / which has the property shown in Table 1 / real ].

[0030] Ball mill distribution of the [example 2] styrene 80 section, 2-ethylhexyl acrylate 20 section, low-molecular-weight-polypropylene 4 section, carbon black (trade name pudding tex 150T) 7 section, chromium system color (trade name BONTORON S-34) 0.5 section and 2, and 2'-azobis (2,4-dimethylvaleronitrile) 2 section was carried out, and homogeneity mixed liquor was obtained.

[0031] Next, the above-mentioned mixed liquor was added in the pure-water 350 section which distributed the calcium phosphate 3 section minutely, and the water dispersion was obtained. A rotor stator mold homomixer performs high shear churning for this water dispersion under with a pH of nine or more conditions, the above-mentioned mixed liquor was underwater made detailed, and it was made to distribute it. This water dispersion was put into the reactor to which the impeller was attached, and the polymerization was performed to the bottom of churning at 65 degrees C for 4 hours.

[0032] Thus, it dissociated and the dispersion liquid containing the obtained polymer were dried, after fully performing acid cleaning and backwashing by water, and the toner ingredient was obtained. In the toner ingredient 100 above-mentioned section, the hydrophobic silica 0.3 section was \*(ed) outside as a plasticizer, and nonmagnetic monocomponent toner was obtained in it. The obtained nonmagnetic monocomponent toner was the particle of a globular form [ target / which has the property shown in Table 1 / real ].

[0033] Nonmagnetic monocomponent toner was obtained by the same approach as an example 1 except using the pure-water 400 section which distributed the [example 3] calcium phosphate 4.5 section minutely. The obtained nonmagnetic monocomponent toner was the particle of a globular form [ target / which has the property shown in Table 1 / real ].

[0034] Nonmagnetic monocomponent toner was obtained by the same approach as an example 2 except using the [example 1 of comparison] styrene 70 section, and the butyl methacrylate 30 section. The obtained nonmagnetic monocomponent toner was the particle of a globular form [ target / which has the property shown in Table 1 / real ].

[0035] Ball mill distribution of the [example 2 of comparison] styrene 90 section, stearyl methacrylate 10 section, low-molecular-weight-polypropylene 4 section, carbon black (trade name black pearl 130) 3 section, chromium system color (trade name BONTORON S-34) 2.0 section and 2, and 2'-azobis (2,4-dimethylvaleronitrile) 2 section was carried out, and homogeneity mixed liquor was obtained.

[0036] Next, the above-mentioned mixed liquor was added in the pure-water 350 section which

distributed the calcium phosphate 3 section minutely, and the water dispersion was obtained. A rotor stator mold homomixer performs high shear churning for this water dispersion under with a pH of nine or more conditions, the above-mentioned mixed liquor was underwater made detailed, and it was made to distribute it. This water dispersion was put into the reactor to which the impeller was attached, and the polymerization was performed to the bottom of churning at 65 degrees C for 4 hours.

[0037] Thus, it dissociated and the dispersion liquid containing the obtained polymer were dried, after fully performing acid cleaning and backwashing by water, and the toner ingredient was obtained. In the toner ingredient 100 above-mentioned section, the hydrophobic silica 0.3 section was **\*\***(ed) outside as a plasticizer, and nonmagnetic monocomponent toner was obtained in it. The obtained nonmagnetic monocomponent toner was the particle of a globular form [ target / which has the property shown in Table 1 / real ].

[0038] The jet mill ground the [example 3 of comparison] styrene-butyl methacrylate copolymer (styrene: butyl methacrylate ratio = 70:30) 100 section, the carbon black (trade name pudding tex 150T) 7 section, the chromium system color (trade name BONTORON S-34) 1.0 section, and the low-molecular-weight-polypropylene 4 section after melting kneading by the kneader, pneumatic elutriation was carried out further, and the toner ingredient was obtained.

[0039] In the toner ingredient 100 above-mentioned section, the hydrophobic silica 0.3 section was **\*\***(ed) outside as a plasticizer, and nonmagnetic monocomponent toner was obtained in it. As the obtained nonmagnetic monocomponent toner was shown in Table 1, the shape factor ( $Sc/Sr$ ) was 1.53 and the product ( $Ax \times D$ ) was the particle of the indeterminate form of 14.6.

[0040] The nonmagnetic monocomponent toner obtained in the <image evaluation of nonmagnetic monocomponent toner> above-mentioned examples 1-3, and the examples 1-3 of a comparison Are equipment which has the configuration of drawing 2 fundamentally, and an organic system photo conductor is used as a photo conductor drum (1). On the development roll (8), image evaluation was carried out with the equipment which has the developing machine of the contact development method which used the rubber of an urethane system for the peripheral face of the conductive base material of the metal heart as toner thickness specification-part material (9) using what prepared the toner support layer of a rubber system. The result of image evaluation was shown in Table 1.

[0041]

[Table 1]

	実施例			比較例		
	1	2	3	1	2	3
トナー特性						
体積平均粒径(dv) ( $\mu\text{m}$ )	11.7	12.0	6.5	12.1	11.8	12.0
体積平均粒径(dv)/個数平均粒径(dn)	1.20	1.21	1.18	1.21	1.15	1.28
形状係数 ( $S_c/S_r$ )	1.05	1.04	1.07	1.05	1.13	1.53
BET 法比表面積 (A) ( $\text{m}^2/\text{g}$ )	0.68	0.67	0.92	0.65	0.72	1.42
真比重 (D)	1.08	1.10	1.10	1.09	1.10	1.10
積 $A \times d_n \times D$	7.2	7.3	5.6	7.2	7.4	14.6
帯電量 (Q) ( $\mu\text{C}/\text{g}$ )	88	61	110	39	115	45
Q/A 比	130	91	120	60	160	32
画像評価結果						
転写性 (*1)	4.0	7.0	8.5	17.8	30.0	25.0
トナー回収に要する電位差(V) (*2)	150	160	180	(*9)	300	250
感光体カブリ (*3)	2.0	5.0	4.7	53.0	3.0	16.2
画像濃度 (*4)	1.32	1.31	1.35	1.40	1.02	1.44
地肌汚れ (*5)	なし	なし	なし	あり	なし	なし
画像ムラ (*6)	なし	なし	なし	なし	あり	なし
ちり (*7)	なし	なし	なし	あり	あり	なし
ゴースト像 (*8)	なし	なし	なし	あり	あり	あり

[0042] (\*1) Imprint nature : it is the value which subtracted the reflection factor when sticking only a mending tape for the value of the reflection factor which imprinted the residual toner of photo conductor drum lifting on paper with the mending tape after the imprint, and was measured with the whiteness degree plan [whiteness degree meter NDW[ by Nippon Denshoku Industries Co., Ltd. ]-1D] on paper from the value measured with the whiteness degree plan. There are so many residual toners that this value is large.

(\*2) The potential difference which toner recovery takes : it is the potential difference of the bias voltage at the time of changing the bias voltage impressed to the development roll, and a ghost image stopping appearing, and the surface potential of a photo conductor drum.

[0043] (\*3) Photo conductor fogging : it is the value which subtracted the reflection factor when sticking only a mending tape for the value of the reflection factor which imprinted the toner of the part of fogging of photo conductor drum lifting on paper with the mending tape, and was measured with the whiteness degree plan on paper from the value measured with the whiteness degree plan. There is so much photo conductor fogging that this value is large.

(\*4) Image concentration : the black solid section was measured using the Macbeth reflection density meter.

(\*5) - (\*8) -- natural complexion dirt, image nonuniformity, dust, and the developer shown in ghost

image: drawing 2 copied 20,000 sheets, and natural complexion dirt, image nonuniformity, dust, and the image property of a ghost image were judged visually, respectively.

(\*9) Since photo conductor fogging was large, the ghost image did not disappear.

[0044] The toner of examples 1-3 had small potential difference  $|V_o - V_e|$  for collecting the toners which remained to photo conductor drum lifting since it excelled in the imprint nature to a transfer paper compared with the bad toner of the imprint nature of the examples 1-3 of a comparison so that clearly from the result shown in Table 1, and the image with the high image concentration which does not have a ghost image over the range where the development bias voltage impressed to a development roll is large was obtained. Moreover, the image was a clear thing without natural complexion dirt, dust, nonuniformity, and a ghost image during the copy covering 20,000 sheets.

[0045] the toner of the example 1 of a comparison -- like, even if it was a globular form toner substantially, the ratio  $(Q/A)$  of the amount of electrifications (Q) and specific surface area (A) was not able to obtain the image in which its image concentration is high even if less than 80 thing changes development bias, since photo conductor fogging is large and imprint nature is also bad, and no ghost image is.

[0046] the toner of the example 2 of a comparison -- that to which the ratio  $(Q/A)$  of the amount of electrifications (Q) and specific surface area (A) exceeds 150 like even if it is a globular form toner substantially has low image concentration, and there are much image nonuniformity and dust. Moreover, if it copies continuously in spite of having set development bias as the proper value, since imprint nature was also bad, the ghost image will have appeared.

[0047] Although there were not natural complexion dirt of an image, dust, and nonuniformity, since the toner of the indeterminate form of the example 3 of a comparison was inferior to imprint nature, in spite of having set development bias as the proper value, since the proper width of face was narrow, when it copied continuously, the ghost image might appear.

[0048]

[Effect of the Invention] According to this invention, in the development approach which cleans to development and coincidence, the improved nonmagnetic 1 component developer to which both image concentration and cleaning nature can be satisfied is offered. The nonmagnetic 1 component developer of this invention is excellent in imprint nature, and gives the clear image which cleans effectively the toner which remained to development and coincidence at photo conductor drum lifting, and does not have a ghost image by high concentration. The nonmagnetic 1 component developer of this invention has high imprint effectiveness, and each large proper condition width of face can be taken about the speed ratio of each surface potentials  $V_o$ ,  $V_e$ , and  $V_q$ , the toner thickness formed on a development roll and a photo conductor drum, and a development roll. According to the nonmagnetic 1 component developer of this invention, also about the image formation equipment for cleaning to development and coincidence, small, a low price, and the unnecessary equipment of maintenance can be realized, and many advantages are brought about practically.

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[Translation done.]

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*not disclosing "in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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CLAIMS

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[Claim(s)]

[Claim 1] Cleaning equipment for image formation equipments characterized by using the cleaning blade which applied to the drainage system solvent the lubricant content liquid which distributed fine-particles lubricant, and a part of part to which this cleaning blade carries out the pressure welding of the residual toner of an image support front face to image support at least in the cleaning equipment removed by the cleaning blade was subsequently made to dry this drainage system solvent, and was obtained.

[Claim 2] Cleaning equipment according to claim 1 with which an acrylic emulsion or acrylic dispersion is contained in this drainage system solvent.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the cleaning equipment for image formation equipments with which the cleaning blade which prepared fine-particles lubricant in the front face has been arranged in more detail about the cleaning equipment for image formation equipments using electrostatic recording processes, such as an electrostatic process copying machine and this printer.

[0002]

[Description of the Prior Art] The cleaning equipment for image formation equipments from which the non-imprinted toner which carries out the pressure welding of one edge of the cleaning blade which consists of an elastic body ingredient to image support, and remains on an image support front face is removed is just going to be known widely. In this cleaning-blade equipment, in order to remove a non-imprinted toner efficiently Since the pressure-welding side to the image support front face of an edge is adjusted so that surface roughness may usually be set to 1micro or less, and also moderate contact pressure is given to this blade If it begins to remove the non-imprinted toner of an image support front face, the frictional resistance of Hazama of the edge side of a cleaning blade and an image support front face will increase. soon -- the edge side of a \*\* cleaning blade -- the so-called" -- being turned over -- " - it will not \*\* -- being easy -- there was a possibility that the removal ability of a non-imprinted toner might fall sharply.

[0003] Then, PTFE, PVdF, SiO<sub>2</sub>, a toner, etc. are consisted of by the edge part of a cleaning blade especially as a means to solve this trouble, and the technique in which particle size applies a fluid good particle 20micro or less as lubricant is proposed. In this technique, since pulverized coal passes through the gap of said edge and image support and brings about a lubrication action, the above blades are turned over and a phenomenon can be avoided.

[0004] Even if it applies this lubricant to the edge section of a blade, this blade however, to cleaning equipment And while being included in image formation equipment, and being conveyed or being kept This much of lubricant will exfoliate or it will disperse, even if it performs copy actuation using the installed image formation equipment, it cannot do the operation when applying lubricant so, but a cleaning blade is turned over and it has the fault that a phenomenon will sometimes arise.

[0005] Although the technique of distributing an organic solvent and drying lubricant which is indicated by JP,2-82283,A after applying to a blade front face in order to heighten the adhesion force to the cleaning blade of lubricant is proposed It is difficult for making an organic solvent distribute this lubricant to homogeneity to find out the solvent which there is a request that are quick-drying, inflammability is low and a thing without toxicity is desirable, and is satisfied with a very difficult top of those conditions to this solvent. Moreover, solvents, such as chlorofluocarbon, have large problems, such as an ozone crack in recent years, and using it should avoid them.

[0006]

[Objects of the Invention] This invention is made in order to solve the above problems. That is, the purpose uses the safest possible solvent, is excellent in workability or economical efficiency, and is to

offer the cleaning equipment which moreover has the removal ability of the approach, the EQC, or the non-imprinted toner beyond it using an organic solvent.

[0007]

[Means for Solving the Problem] this invention persons reach this invention at last, as a result of studying further adhering to this PTFE particle certainly and firmly also unexpectedly based on a header and its point, when the PTFE water dispersion was applied to the pressure-welding side to the image support front face of a cleaning blade as a result of inquiring wholeheartedly that said purpose should be attained, and it dried. That is, the cleaning equipment for image formation equipments characterized by using the cleaning blade which applied to the drainage system solvent the lubricant content liquid which distributed fine-particles lubricant, and a part of part to which this cleaning blade carries out the pressure welding of the residual toner on the front face of a photo conductor to image support at least in the cleaning equipment removed by the cleaning blade was subsequently made to dry this drainage system solvent, and was obtained according to this invention is offered. In addition, they are all a part of above, part in which this cleaning blade carries out a pressure welding to image support at least, a part of pressure-welding side to the image support of a cleaning blade, or the thing which means parts other than the pressure-welding side to the image support of a cleaning blade further.

[0008]

[Detailed Description of the Invention] Hereafter, this invention is explained concretely. The cleaning equipment as used in the field of this invention means the cleaning equipment for image formation equipments characterized by removing the non-imprinted toner of an image support front face using a cleaning blade, and consists of a cleaning blade and edge strips, such as the supporter material. This cleaning blade is the thing of the plate usually obtained from a high molecular compound, especially a giant-molecule elastic body, and support immobilization is carried out to the part of the arbitration in cleaning equipment using a blade electrode holder etc.

[0009] Although it is not restricted especially if it is a thing in ordinary use as a cleaning blade as this high molecular compound, diene system rubber or polyurethane rubbers, such as butadiene rubber and polyisoprene rubber, etc. are available, and it is desirable to use a polyurethane rubber especially, for example. A compounding agent in ordinary use may be combined with these high molecular compounds.

[0010] In this invention, it is the important description that fine-particles lubricant is prepared in a part of the pressure-welding side at the pressure-welding side pan with the front face of the cleaning blade which consists of these high molecular compounds, especially image support. That is, in this invention, since the blade front face adheres to lubricant firmly, a lubrication action is enabled to be able to hold [ long duration ] that the spreading area of this lubricant is narrow.

[0011] The fine-particles lubricant of this invention has especially the desirable thing of fluorine-containing resin, although the well-known thing of fluorine-containing resin, such as polyolefine system resin, such as PE and PP, PTFE, and PVdF, SiO<sub>2</sub>, MoS<sub>2</sub>, toners, or those things by which surface treatment was carried out is usable before this application, and it is still more desirable to use PTFE. A drainage system solvent is made to distribute these lubricant first. To the drainage system solvent 100 weight section, 30 thru/or 250 weight \*\*\*\*\* are still more desirable, and the loadings of this fine-particles lubricant are usually 60 thru/or the 180 weight sections.

[0012] As a drainage system solvent of this invention, although water itself can be illustrated, it is desirable that the compounding agent is added by water for the improvement in the dispersibility of said lubricant or the adhesive improvement of lubricant. As these compounding agents, although a surfactant, pitch powder, a resin emulsifier, a lubrication assistant, various polymers, etc. can be mentioned, a surfactant or a resin emulsion, and resin dispersion are especially suitable.

[0013] Especially as said surfactant, use of the Nonion system surfactants, such as a polyalkylene glycol system and the poly fluoro alkyl ether system, is desirable. Moreover, as a resin emulsion or resin dispersion, the emulsion and dispersion which blended halogen-containing resin, such as vinyl acetate system resin, acrylic resin, and polyvinylidene fluoride, etc. with the emulsifier etc. can be illustrated. As this emulsifier, it is desirable to use said Nonion system surfactant. Especially in these resin



emulsion or resin dispersion, the emulsion and dispersion of acrylic resin are suitable. The fine-particles lubricant which is going to change with the classes and concentration of lubricant, a surface active agent, an emulsifier, a dispersant, resin, etc. to be used, and it is going to distribute is distributed by homogeneity, and moreover, although the loadings to the water of said surface active agent or a resin emulsion, or dispersion are not especially restricted if they are within the limits which can attain the desired end, they can be made below into 20 weight sections to the water 100 weight section, for example.

[0014] If the amount rate of this fine-particles lubricant, water, a surface active agent or a resin emulsion, or dispersion is not suitable, un-arranging will arise in the homogeneity dispersibility of lubricant, workability, the adhesion to the blade of lubricant, or the removal ability of the non-imprinted toner of a cleaning blade.

[0015] Well-known approaches, such as a spray coating cloth method, a roll coating method, or brush painting, can be used for the approach of applying a drainage system solvent to the front face of said blade. Moreover, although the spreading part to a blade may be applied to all the fields by which a pressure welding is carried out to the image support front face of a blade, it is necessary to not necessarily apply it to no fields. That is, especially blade both ends have little surroundings of a toner, and since it is easy to generate "turn over", as shown also, for example in drawing 2, applying only to a part for the both ends of a blade also brings about the effectiveness which was [ be / it / hard coming to generate "turn over" ] excellent.

[0016] As the concrete approach which applies a lubricant content drainage system solvent to the pressure-welding side to the image support of this cleaning blade For example, although the part (21) where the drainage system solvent on this front face of a cleaning blade is applied is exposed as shown also in the perspective view (" drawing 2 ") of the cleaning blade used by this invention By the masking material (20) by which a mask can be carried out, the mask is beforehand made the part which does not want this drainage system solvent to be applied, and it is desirable to apply this drainage system solvent subsequently.

[0017] Although it is required to dry this applied drainage system solvent from a blade front face, 90 degrees C of that desiccation condition are preferably attained 30 thru/or by heating this blade for several seconds thru/or several minutes at 40 thru/or 70 degrees C. The approach using a thermostat as a heating means, the method of blowing warm air, etc. are suitable.

[0018] The condition of having equipped the copying machine with an example of the cleaning equipment of this invention is explained. If " drawing 1 " which is the sectional view showing the important section of the photo conductor equipped with cleaning equipment explains, the image support (11) front face of a photo conductor drum (1) will be charged with a corona discharge vessel, and a latent image will be formed. This latent image is developed by the developer (3), and is imprinted by imprint equipment (4) on the tracing paper (7) conveyed. It is fixed to tracing paper by the anchorage device (5). On the other hand, the toner which remains on an image support front face is supported with a blade electrode holder (61), and fails to be written by the cleaning blade (61) by which a pressure welding is carried out to an image support front face.

[0019]

[Example] Although an example is given and this invention is explained more concretely hereafter, it cannot be overemphasized that this invention is not what is restricted to this example.

[0020] The acrylic water emulsified liquid (JLK-150: made in Japanese Atchison) of the example 110 weight section was made to distribute the polytetrafluoroethylene (PTFE) (a mean diameter  $\phi = 2$  thru/or 3micro; RUBURON L-2:Daikin Industries, LTD. make) of 15 weight sections, and the lubricant content water dispersion was obtained. On the other hand than the edge section, it is a pressure-welding side to the photo conductor of the cleaning blade made from polyurethane currently manufactured beforehand, and the mask of except for an about 5cm part (see drawing 2 ) is carried out in masking material. Said water dispersion is applied to the spreading section on this front face of a blade with a spray method, and spray desiccation of about 60-degree C warm air is carried out for about 30 seconds. The cleaning blade by which the film whose thickness is 6micro was formed in the edge section was

obtained. Coefficient of friction to the paper of the edge section of this blade was 0.4.

[0021] The photo conductor ( $\phi$ :80) front face made from a selenium was made to carry out the pressure welding of the cleaning blade obtained in the example 2 example 1 by the trail method and the 3.5g [m] load, and the photo conductor was rotated (33rpm). The initial running torque of a photo conductor was 2.5 kg-cm.

[0022] The blade which is not processed with a drainage system solvent was obtained using the cleaning blade obtained in the example of comparison 1 example 1. Coefficient of friction of the edge section of this unsettled cleaning blade was 1.5.

[0023] Except using thinner instead of example of comparison 2 acrylic water emulsified liquid, the same actuation as an example 1 was performed, and the cleaning blade was obtained. Coefficient of friction to the paper of the edge section of this blade was 0.6.

[0024] Using the cleaning blade obtained in the example 1 of example of comparison 3 comparison, the same actuation as an example 2 was performed, and the photo conductor was rotated. The initial running torque of a photo conductor was 3.0 kg-cm.

[0025]

[Effect of the Invention] Since the edge section of a blade adheres to fine-particles lubricant uniformly and firmly and exfoliation and scattering of the lubricant from a blade front face are prevented at the time of the assembly of image formation equipment, and transportation, as for cleaning equipment equipped with the cleaning blade of this invention, good lubricity is maintained. So, even if it carried out the pressure welding of the cleaning blade to image support and rotated image support, it made it possible to also ensure the so-called removal of the non-imprinted toner of a cleaning blade which consists in an image support front face, without being turned over and a phenomenon arising [ long duration ] moreover. Furthermore, although lubricant content liquid was applied to all the pressure-welding sides from the former to the image support front face of a cleaning blade Applying very few parts containing the edge section of the both ends of a blade by this invention it made it possible to be able to give the outstanding lubrication action, to combine with using a safe drainage system solvent to the body, an environment, etc., and to offer the cleaning equipment which resembled markedly workability, economical efficiency, non-imprinted toner removal ability, etc., and was excellent in them.

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*not disclosing " ... in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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CLAIMS

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[Claim(s)]

[Claim 1] The cleaning blade characterized by applying the particle which consists of toner components which extracted the coloring agent at the tip of this blade in the cleaning blade which consists of plastics or a rubber elasticity object blade.

[Claim 2] The cleaning blade according to claim 1 which is the particle which the particle which consists of toner components which extracted this coloring agent turns into from the resin powder used as a binder of a toner.

[Claim 3] The cleaning blade according to claim 2 this whose resin powder is the amorphous polymer whose glass transition point temperature (Tg) is 50 thru/or 70 degrees C and, whose softening temperatures are 100 thru/or 150 degrees C.

[Claim 4] It is the cleaning blade according to claim 2 or 3 whose particle size this resin powder is almost spherical and is 10 micrometers or less.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the cleaning blade to which the particle which consists of toner components which extracted the coloring agent as lubricant especially was applied at the tip at least about the cleaning blade used in a xerography or an electrostatic recording method.

[0002]

[Description of the Prior Art] In the xerography or the electrostatic recording method, the imprint process which imprints the toner on the development process which makes a toner adhere to the electrostatic latent image on a photo conductor front face, or the front face of a photo conductor to imprint material, such as paper, is adopted. Although migration removal of most toners is carried out from a photo conductor front face in this imprint process, some toners need to remove this completely from a photo conductor front face in order to remain on a photo conductor front face inevitably.

[0003] Then, in order to remove the toner adhering to a photo conductor, various kinds of cleaning methods are proposed. If it explains briefly using drawing 1 which shows the outline sectional view where the method using a cleaning blade is also one of them, and has arranged the cleaning blade on the photo conductor front face, the pressure welding of the cleaning blade (1) will be carried out to the photo conductor (2) front face, and it will fail to scratch mechanically the residual toner on the photo conductor front face which this cleaning blade rotates. That is, a cleaning blade is arranged so that the lower limit of a blade may contact the horizontal line extended from the core of a near photoconductor drum rotated upward, or the part located in mist or the upper part from it, and if a photo conductor drum rotates, a residual toner will fail to be scratched mechanically. By this method, since the pressure welding of the cleaning blade is strongly carried out on a photo conductor front face at the time of rotation of a photo conductor drum, it is easy to produce the so-called \*\*\*\*\*, and the tip of cleaning has a possibility that cleaning ability may fall extremely.

[0004] The approach which various kinds of means are provided in order [ this ] to be turned over and to prevent a phenomenon, for example, applies lubricant, such as fluororesin powder, such as PTFE, or a graphite, to a cleaning-blade front face is indicated by JP,49-117042,A. Although said possibility that it might be turned over and a phenomenon might arise was considerably canceled by this approach, when especially fluororesin powder is applied to a cleaning-blade front face, it left electric memory on the photo conductor front face, and the new problem of being easy to become surely poor has produced the early image.

[0005] Then, fluoride graphite powder is chosen as lubricant, and the cleaning blade by which this lubricant is applied at least to the tip front face is developed, for example, it is indicated by the publication-number No. 287483 [ two to ] official report. Although the temporary result was obtained by the approach, it was not the forge fire which can still be satisfied enough, and moreover, since this lubricant was expensive, it was more cheap and waited for powerful lubricant and the new proposal about the cleaning blade to which the lubricant was applied.

[0006]

[Objects of the Invention] Then, the purpose of this invention develops the lubricant for [ which \*\*\*\*\* of a cleaning blade is not produced / for / and moreover does not produce electric memory on a photo conductor front face ] the cleaning blades which are cheap, are stabilized and can come to hand, and this lubricant is to offer the cleaning blade applied to the front face.

[0007]

[Means for Solving the Problem] This invention is proposed in order to cancel said trouble, and it is to use the particle which consists of toner components which extracted the coloring agent as lubricant of a cleaning blade. That is, according to this invention, in the cleaning blade which consists of plastics or a rubber elasticity object blade, the cleaning blade characterized by applying the particle which consists of toner components which extracted the coloring agent at the tip of this blade is offered. Moreover, it is desirable that the amorphous polymer whose glass transition point temperature (Tg) is 50 thru/or 70 degrees C and whose softening temperatures are 100 thru/or 150 degrees C is contained in the particle which consists of toner components which extracted the coloring agent, this polymer is almost more nearly spherical still and, as for particle size, it is desirable that it is 10 micrometers or less.

[0008]

[Detailed Description of the Invention] This invention is explained in more detail. As the plastics which constitute said cleaning blade, or an elastic body, well-known things, such as polyethylene, polypropylene, polytetrafluoroethylene, poly hexafluoropropylene, a polycarbonate, a polyurethane rubber, polychloroprene, silicone rubber, and NBR, can be used. Carbon black or a conductive ingredient like lithium perchlorate may be blended with this cleaning blade.

[0009] The important technical feature of this invention is in the point which carried out selection use of the particle which consists of toner components which extracted the coloring agent as lubricant applied to the front face of said cleaning blade. The particle which consists of toner components which extracted the coloring agent as used in the field of this invention means the particle formed considering what extracted the coloring agent from the constituent which constitutes the toner widely known from before this application, especially a nonmagnetic 1 component type toner as starting material. The polymer particle formed from the mixture of a binder and a compounding agent in ordinary use and the thing which removed the coloring agent from the toner used in a toner production process as an example of the particle which consists of toner components which extracted the coloring agent of this invention, or the mixture which uses a resin binder as one component is mentioned. As more concrete mixture, what consists of the compounding agent 0 thru/or 5 weight sections of the binder 88 for toners thru/or 98 weight sections, the household-electric-appliances control agent 1 or 5 weight sections, a plasticizer 1 or 2 weight sections, and others can be illustrated.

[0010] As said resin particle, polystyrene system resin, polymethylmethacrylate, a polyacrylonitrile, acrylonitrile styrene resin, polyethylene wax, low molecular weight polypropylene, a polyvinyl butyral, an epoxy system polymer, polyester, a polyamide, etc. are mentioned. As for these particles, it is desirable that it is almost spherical, and the magnitude of a particle has 1 thru/or 10 especially 3 thru/or desirable 7micro so that it can dissociate from the difference between the common toner used in the development section for development, and the amount of electrifications completely further.

[0011] the plastics or the elastic body which mentioned the above and a cleaning blade above -- for example, the very thing, such as extrusion molding, centrifugal molding, or calender shaping, -- what was fabricated by the well-known shaping approach is used.

[0012] It is applied to the tip front face of a cleaning blade at least although the particle which consists of toner components which extracted said coloring agent as lubricant on the front face of this cleaning blade is applied. As the method of application of said lubricant, a well-known approach is employable. For example, after distributing the solvent which may be made to apply this lubricant to a cleaning-blade front face directly, or may distribute lubricant, it is possible by applying these dispersion liquid to a blade and vaporizing a solvent to also make resin powder apply to a cleaning-blade front face. Moreover, it may be immersed in said dispersion liquid, a cleaning blade may be pulled up, and the approach of drying may be adopted.

[0013] As this solvent, alcohol, toluene, a methyl ethyl ketone, dimethylformamide, dioxane, etc. can be

illustrated.

[0014]

[Effect of the Invention] Since the particle of resin powder existed in a cleaning-blade front face and the cleaning blade with the low frictional resistance value by rolling friction was obtained by this invention, it was hard to produce \*\*\*\*\* of a blade and, moreover, it also became possible to remove the toner which remains on a photo conductor. Furthermore, since the trouble of leaving electric memory on a photo conductor was canceled, it became possible to obtain an image better than the early stages of copy actuation. Moreover, the price of the lubricant of the invention in this application is also cheap, and advantageous on economy.

[0015]

[Example] Below, an example explains this invention in more detail.

The sheet which consists of <example 1> poly caprolactone system polyurethane rubber is cut, and they are thickness 2.0 mm, width of face of 20mm, and the overall length of 310mm. The sheet was obtained. This sheet was attached in the base material with a pressure sensitive adhesive double coated tape and heat adhesive tape, and the cleaning blade was obtained. The spherical-powder end of acrylonitrile system resin (mean particle diameter: 7  $\mu\text{m}$ ) was applied to a part for the point of this cleaning blade. This cleaning blade was attached in the electrophotography copying machine, and the duplication from a manuscript was obtained. A result is shown in Table 1.

[0016] Except applying the <example 1 of comparison> polyvinylidene fluoride resin system powder (KAINA #461) to a direct cleaning-blade front face, the same actuation as an example 1 was performed, and the cleaning blade was obtained. This cleaning blade was attached in the electrophotography copying machine, and the duplication from a manuscript was obtained. A result is shown in Table 1.

[0017] Except using the polyester system resin powder (mean diameter: 7  $\mu\text{m}$ ) of the <example 2 of comparison> indeterminate system, the same actuation as the example 1 of a comparison was performed, and the cleaning blade was obtained. This cleaning blade was attached in the electrophotography copying machine, and the duplication from a manuscript was obtained. A result is shown in Table 1.

[0018]

表 1

	実施例	比較例 1	比較例 2
初期めくれ	A	B	B
初期クリーニング性	1 ～3000枚まで 不良なし	1 ～50枚まで 不良 画像に点状あり	1 ～50枚まで 不良

\* Making the cleaning blade contact in the direction of a counter to the hand of cut of a photo conductor, the linear pressure was set [ mm ] up in 1.0g /, and evaluated the above-mentioned engine performance. *linear pressure 1.0g/mm*

\* "A" of the column turned over the first stage shows that turned-over generating is not seen, and "B" shows that generating turned over from the first stage is seen. Moreover, initial cleaning nature carried out image evaluation by visual observation.

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*not disclosing "in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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CLAIMS

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[Claim(s)]

[Claim 1] The manufacture approach of the cleaning blade characterized by carrying out sticking-by-pressure spreading of the fluororesin system impalpable powder at said elastic body blade before an aliphatic hydrocarbon system cleaning agent washes the cleaning blade which comes to paste supporter material an elastic body blade and this cleaning agent dries.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to amelioration of the manufacture approach of the cleaning blade of the image support front face of electrophotography equipments, such as a copying machine, facsimile, and a printer, in detail about the manufacture approach of a cleaning blade.

[0002]

[Description of the Prior Art] In order to fail to scratch the residual toner of the image support front face of electrophotography equipments, such as a copying machine, facsimile, and a printer, etc. and to clean it conventionally, the cleaning blade which comes to paste supporter material an elastic body blade is used widely. Although, as for the tip of this cleaning blade, elastic bodies, such as polyurethane, were usually used, although these were excellent in elasticity, since skin friction drag was large, the so-called phenomenon of "turn over" which a cleaning-blade tip is dragged to the hand of cut of image support depending on correlation with contact pressure and frictional force, and bends arose, and they had the problem from which a cleaning function is prevented.

[0003] In order to solve such a problem, in order to mitigate friction to the point of a cleaning blade, by the former, making the matter which is rich in slippage, such as fluoro-resin powder, adhere, and mitigating friction is performed. They are the things (for example, JP,3-107983,A and this 3- 107984, 3-107987, etc.) for which the fluoro-resin impalpable powder which the chlorofluocarbon system solvent and the alcohols solvent were made to distribute is applied by spray spraying or dipping as a means to make the matter which is rich in slippage, such as this fluoro-resin powder, adhere to the point of a cleaning blade. Carrying out direct pressure-welding adhesion of the fluoro-resin impalpable powder at the point of a cleaning blade etc. is performed.

[0004]

[Description of the Prior Art] However, when a chlorofluocarbon system solvent tends to be restricted and use of global environment problems etc. to future made an alcohols solvent distribute [ solvent ] fluoro-resin impalpable powder, since powder tends to have precipitated, the precipitation arrester was needed, and since the flash point of an alcohols solvent was low, it had a problem on safety, and the sanitary problem to which an operator attracts an alcohols solvent.

[0005] Solvent scattering to the circumference is remarkable, and spray painting had a problem the point on the point of effectiveness, and insurance health, and sticking-by-pressure spreading had the problem that it was low and could be easy to take adhesion force.

[0006]

[Problem(s) to be Solved by the Invention] This invention is made in view of the above-mentioned trouble for the purpose of offering the manufacture approach of the improved cleaning blade which adhesion of the fluoro-resin impalpable powder for frictional force mitigation at the tip of a cleaning blade etc. can carry out easily.

[0007]

[Means for Solving the Problem] That is, the manufacture approach of the cleaning blade this invention



is characterized by carrying out sticking-by-pressure spreading of the fluororesin system impalpable powder at said elastic body blade, before an aliphatic hydrocarbon system cleaning agent washes the cleaning blade which comes to paste supporter material an elastic body blade and this cleaning agent dries.

[0008]

[Function] If sticking-by-pressure spreading of the fluororesin system impalpable powder is carried out before this cleaning agent dries after an aliphatic hydrocarbon system cleaning agent washes the cleaning blade which pasted up and manufactured the elastic body blade to supporter material, according to the condensation and dispersion effect over the powder of this cleaning agent, fluororesin system impalpable powder will carry out breadth homogeneity distribution thinly on an elastic body blade front face, and will adhere to the blade front face made from polyurethane.

[0009] On the other hand, since fluororesin system impalpable powder has good adhesion to an elastic body blade, the fluororesin system impalpable powder which spread thinly adheres to an elastic body blade front face firmly with the vaporization of a cleaning agent. Therefore, adhesion of fluororesin system impalpable powder is attained, without requiring processing of a spray, dipping, etc.

[0010]

[Example] Next, the example of this invention is explained. The sectional view in which drawing 1 shows the sticking-by-pressure coater and spreading condition of fluororesin system impalpable powder, and drawing 2 are the sectional views of the cleaning blade used in the example of this invention.

[0011] As shown in drawing 2, after manufacturing the cleaning blade 1 which comes to paste up elastic body blade 1B made into the product made from polyurethane, the product made of a fluororubber, and the product made of silicone rubber at metal supporter material 1A, A point and near elastic body blade 1B are wiped to a longitudinal direction with the sponge object in which the aliphatic hydrocarbon system cleaning agent was included, finishing washing is performed, after washing termination and within [ a cleaning agent has not yet volatilized completely ] less than 10 seconds, blade section 1B was pressed against the spreading base 2 shown in drawing 1, and impalpable powder was made to adhere.

[0012] The upper part covers and contains sponge 2B by cheesecloth 2C in box 2A which carried out opening, and this spreading base 2 lengthens fluororesin system impalpable powder thinly with the brush on this cheesecloth 2C front face. since sponge 2B has cushioning properties -- blade section 1B -- pressing -- receiving -- the point circumference of blade member 1B -- a powder object -- moderate -- dispersing -- abbreviation -- uniform spreading was performed.

[0013] Moreover, since the point front face of blade section 1B was in the condition which got wet in aliphatic hydrocarbon system cleaning agent 1C, the adhesion of fluororesin system impalpable powder was good, and, as for fluororesin system impalpable powder, after vaporization of a cleaning agent had adhered good.

[0014] As an example of a comparison, an aliphatic hydrocarbon system cleaning agent performs finishing washing of elastic body blade 1B like an example, and it is after [ washing termination ] abbreviation. After volatilizing a cleaning agent completely, blade section 1B was pressed against the spreading base 2 shown in drawing 2, and impalpable powder was made to adhere to it after 120-minute progress. The result of having performed the verification test turned over about an example and the example of a comparison in early stages of the blade in the adhesion of fluororesin impalpable powder and the copying machine system was as in Table 1.

[0015]

[Table 1]

	実施例	比較例
フッ素樹脂微粉末 付着方法	脂肪族炭化水素系溶剤 未揮発状態で塗布	脂肪族炭化水素系溶剤 揮発後 塗布
微粉末付着性 <sup>(1)</sup>	微粉末の飛散 無し	微粉末の飛散 有り
ブレード初期 めくれ <sup>(2)</sup>	無し	有り (約30%)

(1) Metal supporter material was fixed, vibration of a predetermined frequency was given, and contrast observation of the impalpable powder adhesion condition of an elastic blade point was carried out visually.

(2) (1) after a check and a plain paper copier -- attaching -- image appearance -- carrying out (white solid image) -- it carried out and the existence in which the elastic body blade to ten sheets is turned over the first stage was checked.

[0016]

[Effect of the Invention] It has various effectiveness [ simplify / since can make fluororesin system impalpable powder adhere good on a blade front face, without completely using the solvent which poses an environmental sanitation top problem according to / as explained above / the approach of this invention, a facility of a spray equipment and dipping tub etc. is also unnecessary, there is also no insurance sanitary problem and adhesion is moreover possible immediately after a washing process, become easy / manufacture /, and / an activity ].

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[Translation done.]

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$$7.5 \times 10^{-4} \text{ g/cm}^2 \\ = 75 \text{ mg/cm}^2$$

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CLAIMS

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[Claim(s)]

[Claim 1] The surface treatment approach of the cleaning blade for image formation equipments which applies the lubricant dispersion liquid to which surface tension made the fluorine system inactive liquid of  $8 \times 10^{-5}$  thru/or  $18 \times 10^{-5}$  N/cm distribute fine-particles lubricant to the part which carries out a pressure welding to the image support of a cleaning blade, and is characterized by drying.

[Claim 2] The surface treatment approach of the cleaning blade for image formation equipments according to claim 1 characterized by fluorine system inactive liquids being a carbon number 5 thru/or a fluorine-containing hydrocarbon derivative of 8.

[Claim 3] The surface treatment approach of the cleaning blade for image formation equipments according to claim 1 characterized by the surface tension of a fluorine system inactive liquid being  $10 \times 10^{-5}$  thru/or  $15 \times 10^{-5}$  N/cm.

[Claim 4] The surface treatment approach of the cleaning blade for image formation equipments according to claim 1 characterized by the weight ratios of fine-particles lubricant and a fluorine system inactive liquid being 1:10 thru/or 1:80.

[Claim 5] The surface treatment approach of the cleaning blade for image formation equipments according to claim 1 characterized by fine-particles lubricant being a resin particle.

[Claim 6] The cleaning blade for image formation equipments characterized by having applied the lubricant dispersion liquid to which surface tension made the fluorine system inactive liquid of  $8 \times 10^{-5}$  thru/or  $18 \times 10^{-5}$  N/cm distribute fine-particles lubricant to the part which carries out a pressure welding to the image support of a cleaning blade, and carrying out surface preparation by drying.

[Claim 7] The image formation approach that the process which removes this residual toner is characterized by using a cleaning blade according to claim 6 in the image formation approach of having the process which forms a toner image on image support, the process which imprints this toner image on an imprint object, and the process which removes the residual toner on image support.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the cleaning blade by which surface preparation was carried out to fine-particles lubricant, its surface art, and the image formation approach using the cleaning blade in detail about the cleaning blade by which surface preparation was carried out, its surface art, and the image formation approach for using it for the image formation equipment using electrostatic recording processes, such as an electrostatic process copying machine and an electro photographic printer.

[0002]

[Description of the Prior Art] The cleaning equipment for image formation from which the pressure welding of one edge of the cleaning blade which consists of an elastic body ingredient is carried out to image support, and the residual toner of an image support front face is removed is known widely. In order to remove a non-imprinted residual toner efficiently, in this cleaning equipment the pressure-welding side to the image support front face of a cleaning blade. Usually, since it is adjusted upwards so that surface roughness may be set to 1 micrometer or less, and moderate contact pressure is given to this cleaning blade. In the early stages of use, when it began to have removed the residual toner of an image support front face, the frictional resistance of the pressure-welding side of a cleaning blade and an image support front face increased, and there was a possibility that might become easy to generate \*\*\*\*\* of a cleaning blade and a role of cleaning equipment might fall sharply. Then, the technique which sprinkles and applies the fine-particles lubricant of a particle to the edge part of a cleaning blade especially as a means to solve this trouble is proposed.

[0003] According to this technique, fine-particles lubricant can bring about a lubrication action between an edge part and an image support front face, and can avoid \*\*\*\*\* of a cleaning blade. However, even if it applied this fine-particles lubricant to the edge part of a cleaning blade, when equipping cleaning equipment with that cleaning blade and including in image formation equipment, much fine-particles lubricant had the problem that \*\*\*\*\* of a cleaning blade occurred, between transportation or storage, even if it exfoliated or performed copy actuation using the image formation equipment dispersed and incorporated. Then, as the method of application which is uniform and moreover heightens the adhesion force to the edge part of a cleaning blade, the technique to dry is proposed in recent years, after making an organic solvent and water distribute lubricant and applying to a cleaning-blade front face. As such a technique, distributing fine-particles lubricant in volatile fluid, such as chlorofluocarbon and alcohol, and applying to a cleaning blade is proposed by JP,2-82283,A. Moreover, distributing fine-particles lubricant in a drainage system liquid, and applying to a cleaning blade is proposed by JP,6-186897,A.

[0004]

[Problem(s) to be Solved by the Invention] However, by these approaches, the dispersibility of fine-particles lubricant needed to be low, and needed to apply to homogeneity, and a lot of fine-particles lubricant needed to be applied for stopping \*\*\*\*\* of a cleaning blade. Therefore, since it was applied in large quantities, exfoliation or the problem of being easy to separate was hanging around [ lubricant ].

When peeling of lubricant happens, \*\*\*\*\* of a cleaning blade occurs, or other parts of image formation equipment are polluted, and there is [ whether it is a lifting and ] nothing about the bad effect on image quality. Moreover, when the solvent of a drainage system is used, in order to distribute fine-particles lubricant using a surfactant, a surfactant tends to adhere on image support, for example, a photo conductor, and there is a problem of being easy to produce generating of deterioration of a photo conductor, filming by the toner, etc. Moreover, it was difficult to find out the solvent with which has a demand that inflammability is low quick-drying and a thing without toxicity is desirable, and it is satisfied of those conditions to these solvents. Moreover, solvents, such as chlorofluocarbon, have big problems, such as ozone breakage, and avoiding the use is called for.

[0005] This invention is made in order to solve the above problems. That is, the purpose of this invention has good dispersibility and it is to offer the approach of carrying out surface treatment of the cleaning blade using the fine-particles lubricant from which the lubrication effectiveness is acquired to fewer fine-particles lubricant. The purpose of further others of this invention does not have toxicity, uses a safe solvent, is excellent in workability quick-drying, and, moreover, is to offer [ equivalent to an old technique, or ] the surface treatment approach of a cleaning blade that a residual toner is efficiently removable more than it. Other purposes of this invention are to offer the cleaning blade which peeling of fine particles does not generate at the time of transportation and by which surface preparation was carried out, and the image formation approach using it.

[0006]

[Means for Solving the Problem] The above-mentioned purpose of this invention can apply to a cleaning blade the lubricant dispersion liquid to which surface tension made the fluorine system inactive liquid of 8 thru/or 18 dynes/cm distribute fine-particles lubricant, and can attain them by subsequently drying volatile fluid.

[0007] That is, the surface-preparation approach of the cleaning blade for image formation equipments of this invention applies the lubricant dispersion liquid to which surface tension made the fluorine system inactive liquid of  $8 \times 10^{-5}$  thru/or  $18 \times 10^{-5}$  N/cm distribute fine-particles lubricant to the part which carries out a pressure welding to the image support of a cleaning blade, and is characterized by drying. The cleaning blade for image formation equipments of this invention is characterized by having applied the above-mentioned lubricant dispersion liquid and carrying out surface treatment by drying. Moreover, the image formation approach of this invention is characterized by having the process which forms a toner image on image support, the process which imprints this toner image on an imprint object, and the process which removes the residual toner on image support, and using the above-mentioned cleaning blade by which surface preparation was carried out in the process which removes a residual toner.

[0008] Hereafter, this invention is explained to a detail. Although the cleaning blade by which surface preparation is carried out is the thing of the tabular gestalt usually acquired from a high molecular compound, especially a macromolecule elastic body, and it is not restricted in this invention especially if well-known, synthetic rubber, such as diene system rubber, such as butadiene rubber and polyisoprene rubber, and a polyurethane rubber, is available, and it is desirable to produce by using especially a polyurethane rubber, for example. A compounding agent in ordinary use may be combined with these high molecular compounds. In that case, silicone oil and a fluorochemical surfactant can be used. Moreover, particles, such as silicone resin and a silica, may be blended.

[0009] In this invention, the above-mentioned cleaning blade has desirable resin impalpable powder, such as a toner containing acrylic resin, polystyrene, polyvinylidene fluoride, and binding resin, as fine-particles lubricant, although surface preparation of the part which carries out a pressure welding to the image support is carried out using fine-particles lubricant. Especially acrylic resin impalpable powder is desirable as what there is the friction reduction effectiveness and does not have bad effect on a cleaning blade, image support (for example, photo conductor) or a toner, etc. As acrylic resin impalpable powder, an acrylic ester polymer and a methacrylic ester polymer are used, and especially polymethylmethacrylate is desirable. When acrylic resin impalpable powder is used, since the operation which it is hard coming to generate the charge at the time of being rubbed between a cleaning blade and

image support, and bars the electrostatic memory of a photo conductor is carried out, it is desirable. Moreover, the especially spherical thing of the configuration of the above-mentioned fine-particles lubricant is desirable. the mean particle diameter of fine-particles lubricant -- 0.05 -- or especially 0.1 thru/or the range of 2 micrometers is desirable 5 micrometers.

[0010] Although it applies to the part which surface tension makes the fluorine system inactive liquid of  $8 \times 10^{-5}$  thru/or  $18 \times 10^{-5}$  N/cm distribute [ part ] it, and lubricant dispersion liquid are prepared [ part ], and carries out the pressure welding of it to image support in order to carry out surface treatment using the above-mentioned fine-particles lubricant In this invention, the surface tension of a fluorine system inactive liquid needs to be in the range of  $8 \times 10^{-5}$  thru/or  $18 \times 10^{-5}$  N/cm, and its use of the fluorine system inactive liquid of the range of  $10 \times 10^{-5}$  thru/or  $15 \times 10^{-5}$  N/cm is especially desirable. By using the fluorine system inactive liquid of the above-mentioned range, distribution of fine-particles lubricant becomes good and the coat plasticity at the time of spreading becomes good. Since surface tension is comparatively low, surface wettability goes up and this is considered for a contact angle to fall. Moreover, when that to which surface tension exceeded  $18 \times 10^{-5}$  N/cm is used, the dispersibility of fine-particles lubricant falls and handling [ ordinary temperature ] of a thing lower than  $8 \times 10^{-5}$  N/cm another side becomes difficult that it is easy to evaporate.

[0011] In this invention, a carbon number 5 thru/or the fluorine-containing hydrocarbon derivative of 8 are preferably used as surface tension  $8 \times 10^{-5}$  thru/or a fluorine system inactive liquid of  $18 \times 10^{-5}$  N/cm. Specifically, FURORINATO (C five F12) (surface tension  $10 \times 10^{-5}$  N/cm), C5 F11NO (surface tension  $13 \times 10^{-5}$  N/cm), C6 F14 (surface tension  $12 \times 10^{-5}$  N/cm), C7 F16 (surface tension  $13 \times 10^{-5}$  N/cm), C8 F18 (surface tension  $15 \times 10^{-5}$  N/cm), etc. are raised as a desirable thing. These solvents do not have bad effect on a cleaning blade, image support (photo conductor), a toner, etc. a top harmless to people by quick-drying, and ozone modulus of rupture is also zero and they have the advantage of not having a bad influence on an environment, either.

[0012] What is necessary is just to blend fine-particles lubricant and a fluorine system inactive liquid by the weight ratio 1:10-1:80, when distributing the above-mentioned fine-particles lubricant in the above-mentioned fluorine system inactive liquid and preparing lubricant dispersion liquid. It blends in 1:20-1:60 more desirably. If the compounding ratio to the fluorine system inactive liquid of fine-particles lubricant is smaller than the above-mentioned range, lubricant peels from a cleaning blade by transportation, and if large, \*\*\*\*\* of a cleaning blade will occur. Thus, the blended mixture continues distribution continuously by the churning child over 1 minute - 10 minutes with ultrasonic distribution equipment. It becomes possible to obtain the lubricant dispersion liquid by which homogeneity distribution was held by that cause, to be stabilized to the edge part of a cleaning blade, and to apply to homogeneity.

[0013] The lubricant dispersion liquid obtained as mentioned above can be applied by well-known approaches, such as for example, a spray coating cloth method, a roll coating method, or brush painting. moreover, the coverage of lubricant dispersion liquid --  $1.0 \times 10^{-3}$  -  $1.0$  ml/cm<sup>2</sup> -- more -- desirable --  $1.0 \times 10^{-3}$  -  $1.0$  ml/cm<sup>2</sup>  $8.4 \times 10^{-3}$  -  $3.0 \times 10^{-2}$  ml/cm<sup>2</sup> and further  $1.0 \times 10^{-2}$  -  $2.0 \times 10^{-2}$  ml/cm<sup>2</sup> The range is used preferably.

[0014] Although it removes by drying volatile fluid after applying to the edge part of a cleaning blade, air drying or an air dried can perform desiccation at a room temperature. Fine-particles lubricant adheres to a cleaning-blade front face uniformly and firmly by it, and the cleaning blade to which surface preparation of this invention was carried out is obtained.

[0015] Next, the image formation approach using the cleaning blade to which surface preparation of this invention was carried out [ above-mentioned ] is explained. In this invention, the process that the process which forms a toner image on image support is well-known is adopted. As image support, if an electrophotography photo conductor, a dielectric record object, etc. can support an electrostatic latent image, what so-called \*\* can also be used. After forming an electrostatic latent image by the well-known approach on these images support, negatives are developed using a toner and a toner image is formed. Subsequently the formed toner image is imprinted on imprint objects, such as paper, by the well-known approach, and, subsequently it is fixed to the imprinted toner image. On the other hand, although the toner which remained on image support is removed in the process which removes a residual

liquid  
 $1.0 \times 10^{-3}$  -  $1.0$  ml/cm<sup>2</sup>  
 ↓  
 not the amount of fine particles

toner, in this invention, the above-mentioned cleaning blade by which surface preparation was carried out is used as a cleaning blade. Thereby, a cleaning blade is turned over over a long period of time, there is no \*\*, and it becomes possible to form a good image.

[0016]

[Example]

As example 1 cleaning blade, the polyurethane-rubber blade with an overall length [ of 237.4mm ] and a thickness of 1.5mm was used. As fine-particles lubricant, the spherical polymethylmethacrylate (average molecular weight: about 400,000) of 0.5 micrometers of mean diameters was used. The amount of the fine-particles lubricant used per cleaning-blade piece was  $7.14 \times 10^{-4}$  to 3 g (coverage per unit area:  $7.5 \times 10^{-4} \text{ g/cm}^2$ ). The fine particles of polymethylmethacrylate were blended with C six F14 so that it might be set to 1:10, 1:25, 1:40, 1:60, and 1:80 by the weight ratio, respectively, and they were distributed. The constant rate of the obtained lubricant dispersion liquid was sucked up with the pump, and the lubricant dispersion liquid of the part were dropped and applied to the edge part of a cleaning blade as a drop from the tip of a nozzle. Then, it seasoned naturally at the room temperature and the surface-preparation cleaning blade was obtained. The torque value produced between a cleaning blade and image support (photo conductor) when [ all ] obtained as mentioned above was smaller than the case where a well-known cleaning blade is used conventionally, and the effectiveness in fewer lubricant was accepted. Moreover, as for the spreading part, lubricant was applied to homogeneity. Furthermore, peeling of lubricant and scattering were not in vibration/fall test and the transportation test.

[0017] As for the cleaning blade sprinkled on the front face as it was, as example of comparison 1 fine-particles lubricant, \*\*\*\*\* of a cleaning blade occurred frequently using the fine particles of the same polymethylmethacrylate as an example 1. Therefore, the fine particles of polymethylmethacrylate had to be sprinkled also to image support.

When chlorofluorocarbon 113 ( $19 \times 10^{-5}$  to  $5 \text{ N/cm}$  surface tension) was made to distribute the fine particles of the same polymethylmethacrylate as example of comparison 2 example 1, dispersibility is inadequate, the unevenness of lubricant arose in the spreading layer at the time of spreading, and peeling of lubricant arose.

When the cleaning blade sprinkled on the front face as it was using the fine particles (0.5 micrometers of mean diameters) of example of comparison 3 polyvinylidene fluoride was used, \*\*\*\*\* of a clay NINGU blade occurred frequently. Therefore, the fine particles of polyvinylidene fluoride had to be sprinkled also to image support. Even in such a case, torque was higher than the thing of this invention.

[0018] The cleaning blade by which surface preparation was carried out in the example 2 example 1 was included in image formation equipment (--1000, NEC Corp. make). It copied using this image formation equipment. That is, the toner image which has styrene-acrylic binding resin was formed on the image support which consists of an organic photo conductor, subsequently to a transfer paper it imprinted, and the residual toner was removed. consequently, a cleaning blade -- being turned over -- there is nothing and removal of a residual toner carries out good from the first stage -- having -- many -- poor cleaning was not generated over several sheets.

[0019]

[Effect of the Invention] Since the surface-preparation approach of this invention has the above-mentioned configuration, the edge part of a cleaning blade adheres to it firmly [ the fine-particles lubricant of a small amount ] moreover in homogeneity. Moreover, since surface tension  $8 \times 10^{-5}$  thru/ or the fluorine system inactive liquid of  $18 \times 10^{-5} \text{ N/cm}$  are used, since it is quick-drying, a compulsory desiccation means like a water solution is also unnecessary, and while it is perfect, it excels in workability and economical efficiency to the body and an environment. Moreover, the cleaning equipment equipped with the cleaning blade to which surface preparation of this invention was carried out Since fine-particles lubricant is little to homogeneity and the edge part of a cleaning blade moreover adheres to it firmly at it Even if peeling of the lubricant from a cleaning-blade front face and scattering are prevented, and good lubricity is maintained at the time of the assembly of image formation equipment, and transportation, consequently it carries out the pressure welding of the cleaning blade to image support and it rotates image support It becomes possible to ensure removal of the residual toner

which remains on an image support front face over long duration moreover, without turning over a cleaning blade and a phenomenon arising. furthermore, the removal capacity of a residual toner etc. makes it possible to offer the cleaning equipment which was markedly alike and was excellent. Moreover, according to the image formation equipment of this invention, it is possible to obtain the image which was excellent over the long period of time.

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[Translation done.]



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*not disclosing "in an amount of 1 to 10 mg/cm<sup>2</sup>"*

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## CLAIMS

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### [Claim(s)]

[Claim 1] Cleaning equipment characterized by having applied the indeterminate form particle to the edge section of said elastic blade, and applying a globular form particle to said electrophotography photo conductor front face in the cleaning equipment from which the toner which was made to carry out the pressure welding of the edge of an elastic blade to an electrophotography photo conductor, and remained to the electrophotography photo conductor is removed.

[Claim 2] The cleaning equipment characterized by to have prepared the sheet member arranged in contact with said electrophotography photo conductor rather than said elastic blade at the improvement style side in the method of rotation of an electrophotography photo conductor in the cleaning equipment from which the toner which was made to carry out the pressure welding of the edge of an elastic blade to an electrophotography photo conductor, and remained to the electrophotography photo conductor is removed, to have applied the indeterminate-form particle to the edge section of said elastic blade, and to apply a globular form particle to the contact section with the electrophotography photo conductor of said sheet member.

[Claim 3] For said indeterminate form particle and globular form particle, K is 130, when a particle boundary length is set to a and they set particle projected area to b and shape factor  $K=100 a^2 / 4\pi b$ . The following are made into a globular form particle and K is 130. Cleaning equipment according to claim 1 or 2 which makes what is exceeded an indeterminate form particle. 1.3

[Claim 4] The process cartridge which equips the body of image formation equipment with a cleaning means to remove the toner which remained to the electrophotography photo conductor and said electrophotography photo conductor in a removable process cartridge, and is characterized by using cleaning equipment according to claim 1 or 2 as said cleaning means.

[Claim 5] Image formation equipment characterized by having a wearing means for equipping with a process cartridge according to claim 4 dismountable, and a conveyance means for conveying a record medium in the image formation equipment which is removable in a process cartridge and forms an image in a record medium.

[Claim 6] In the image formation equipment which forms an image in a record medium An electrophotography photo conductor, The development means for developing the latent image formed in said electrophotography photo conductor, and the imprint means for imprinting the image developed to said electrophotography photo conductor to a record medium, Image formation equipment which is equipped with the cleaning means for removing the toner which remained to the electrophotography photo conductor after an imprint, and is characterized by using cleaning equipment according to claim 1 or 2 as said cleaning means.

[Claim 7] Said image formation equipment is image formation equipment according to claim 5 or 6 characterized by being an electrophotography copying machine, a laser beam printer, or facsimile apparatus.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the image formation equipment which can equip with a process cartridge and said process cartridge.

[0002] As image formation equipment, an electrophotography copying machine, an electro photographic printer, electrophotography facsimile apparatus (for example, an LED printer, a laser beam printer, etc.), an electrophotography word processor, etc. are contained here, for example.

[0003] Moreover, as a process cartridge, a cleaning means and an electrophotography photo conductor are cartridge-ized in one at least, and this cartridge is made removable to the body of image formation equipment.

[0004]

[Description of the Prior Art] Conventionally, in the image formation equipment using an electrophotography image formation process, a process means to act on an electrophotography photo conductor and said electrophotography photo conductor is cartridge-ized in one, and the process cartridge method which makes this cartridge removable at the body of image formation equipment is adopted. since the maintenance of equipment can be performed for user itself according to this process cartridge method, without being based on a serviceman, it can be markedly alike and operability can be raised. Therefore, this process cartridge method is widely used in image formation equipment.

[0005] If it is in the above-mentioned process cartridge, after imprinting the toner image which carried out electrophotography photo conductor formation to a record medium, he is trying for cleaning equipment to remove the toner which remained to the electrophotography photo conductor. The configuration of generally being used as this cleaning equipment makes the front face of an electrophotography photo conductor carry out the pressure welding of the elastic blade which consists of a chip-like rubber member, and it fails to scratch the toner which remained to this photo conductor with rotation of an electrophotography photo conductor, and he is trying to remove it.

[0006]

[Problem(s) to be Solved by the Invention] The place where this invention is developed further at and sets the above-mentioned cleaning equipment as the purpose offers the cleaning equipment which it is stabilized and can obtain the lubrication action between an electrophotography photo conductor and an elastic blade from the early stages of use over a long period of time.

[0007]

[Means for Solving the Problem] The typical configuration concerning this invention for attaining the above-mentioned purpose becomes in the cleaning equipment from which the toner which was made to carry out the pressure welding of the edge of an elastic blade to an electrophotography photo conductor, and remained to the electrophotography photo conductor is removed considering having applied the indeterminate form particle to the edge section of said elastic blade, and having applied the globular form particle to said electrophotography photo conductor front face as a description.

[0008] Moreover, it sets to the cleaning equipment from which the toner which was made to carry out

the pressure welding of the edge of an elastic blade to an electrophotography photo conductor, and remained to the electrophotography photo conductor as other configurations is removed. It becomes considering having prepared the sheet member arranged in contact with said electrophotography photo conductor rather than said elastic blade at the improvement style side in the method of rotation of an electrophotography photo conductor, having applied the indeterminate form particle to the edge section of said elastic blade, and having applied the globular form particle to the contact section with the electrophotography photo conductor of said sheet member as a description.

[0009]

[Function] If it is in the above-mentioned configuration, it is in early stages of use and it continues for a long period of time by the globular form particle again, the lubrication action between an elastic blade and an electrophotography photo conductor is obtained by the indeterminate form particle. For this reason, when an image is formed with the process cartridge or image formation equipment using this cleaning equipment, the abnormal sound by friction between said elastic blades and electrophotography photo conductors occurs, or there is no possibility that \*\*\*\*\* may occur to an elastic blade.

[0010]

[Example] Next, one example concerning this invention is explained with reference to a drawing.

[0011] The [1st example] If it is in the 1st example, the image formation equipment which can equip with the process cartridge and this cartridge using the cleaning equipment concerning this invention is illustrated and explained. In addition, the whole image formation equipment configuration using a process cartridge and this as sequence of explanation is explained first, and here explains the configuration of cleaning equipment below.

[0012] {Whole configuration} As shown in drawing 4, this electrophotography image formation equipment (laser beam printer) A irradiates the information light based on image information from optical system 1 to the electrophotography photo conductor of a drum configuration, forms a latent image in this photo conductor, develops this latent image and forms a toner image. And while one sheet carries out separation feed at a time synchronizing with formation of said toner image by pressure-welding member 3c which carries out the pressure welding of the record medium 2 to pickup roller 3b and this from sheet paper cassette 3a It conveys with the conveyance means 3 which consists of 3d of conveyance roller pairs, resist roller pair 3e, etc. And by carrying out electrical-potential-difference impression of the toner image formed in said electrophotography photo conductor cartridge-ized as a process cartridge B at the imprint roller 4 as an imprint means, it imprints to a record medium 2 and the record medium 2 is conveyed to the fixing means 5 by conveyance belt 3f. By base material 5c, this fixing means 5 impresses heat and a pressure to the record medium 2 which consists of 5d of fixing rotations constituted from a tubed sheet supported pivotable, and is passed, and is established in an imprint toner image while it builds in driving roller 5a and heater 5b. and this record medium 2 -- 3g of discharge roller pairs, and 3h -- conveying -- a reversal conveyance path -- letting it pass -- the discharge section 6 -- discharge -- it needs -- it constitutes. In addition, manual bypass feed is also possible for this image formation equipment A by detachable tray 3i and roller 3j.

[0013] On the other hand, said process cartridge B is equipped with the cleaning means for cleaning the toner which remained to the electrophotography photo conductor and said electrophotography photo conductor at least. As a process means to act on an electrophotography photo conductor here, there are an electrification means to electrify the electrophotography photo conductor other than said cleaning means, a development means to develop the latent image formed in the electrophotography photo conductor, etc. The process cartridge B of this example rotates the photo conductor drum 7 which is the electrophotography photo conductor which has a sensitization layer as shown in drawing 5, carries out electrical-potential-difference impression to the electrification roller 8 which is an electrification means, is uniformly charged in the front face of said photo conductor drum 7, exposes the light figure from said optical system 1 through opening 9 to this electrified photo conductor drum 7, forms a latent image, and it constitutes it so that this latent image may develop with the development means 10.

[0014] Said development means 10 sends out the toner in toner compartment 10a by the pivotable 1st toner delivery member ten b1 and the 2nd toner delivery member ten b2 which are a delivery means.

While rotating 10d of developing rollers which are the development member which built in stationary magnet 10c The toner layer which gave the frictional electrification charge by development blade 10e is formed in the front face of 10d of developing rollers, and a toner image is formed and formed into a visible image by transferring the toner to the photo conductor drum 7 according to said latent image. [0015] And after impressing the electrical potential difference of said toner image and reversed polarity to the imprint roller 4 and imprinting a toner image to a record medium 2, with a cleaning means 11 to mention later, it is failed to scratch the toner which remained to the photo conductor drum 7, and this is removed.

[0016] In the cartridge frame which combined the toner development frame 12 which is the 1st frame, and the cleaning frame 13 which is the 2nd frame, hold support is carried out, each part material of said photo conductor drum 7 grade is cartridge-ized, and the body 14 of equipment is equipped with it dismountable.

[0017] if a cartridge wearing means opens the closing motion member 15 focusing on shaft 15a (refer to drawing 4), as shown in drawing 6, it falls in the right-and-left both-sides side of a cartridge wearing tooth space a front, it is [ come out, ] in it, the guide rail 16 formed in the curve configuration (this example approximate circle arc configuration) which bulges below has been formed in the abbreviation symmetry (drawing 6 illustrates only one side), and the guide member 17 has been attached in the upper part.

[0018] On the other hand, corresponding to said guide rail 16, the guide section guided along with a guide rail 16 is formed in longitudinal direction both the lateral surface of a process cartridge B. This guide section is constituted so that it may project from the abbreviation bilateral symmetry location of longitudinal direction both the lateral surface of a cartridge frame, and as shown in drawing 5, it unifies and constitutes the boss 18 and the rib 19. Said boss 18 and rib 19 are formed in the cleaning frame 13 furnished with the photo conductor drum 7 in one, the section is located on the production of the revolving shaft of the photo conductor drum 7, and the boss 18 is installing the rib 19 in the curve configuration (this example approximate circle arc configuration) which bulged below according to the configuration of a guide rail 16 continuously behind [ path-of-insertion ] the process cartridge B from said boss 18.

[0019] In the above-mentioned configuration, in equipping with a process cartridge B, open the closing motion member 15 and a boss 18 and a rib 19 are made to meet a guide rail 16, and it inserts so that a cartridge tip may be made hidden under the optical means 1 of equipment. While having formed the guide rail 16 in the approximate circle arc, a process cartridge B becomes an abbreviation horizontal as the guide member 17 in the upper part is also carrying out the configuration where this was imitated, and it inserts, since a rib 19 is also the same approximate circle arc. Furthermore, if Cartridge B is pushed in, a boss 18 will be depressed in receptacle crevice 16a formed in the termination of a guide rail 16. Thereby, the drum gear (not shown) which fixed to the side edge of the photo conductor drum 7 meshes with the drive gear by the side of the body 14 of equipment (not shown), and the transfer of driving force of it is attained to a process cartridge B. Moreover, a process cartridge can be removed by removing a boss 18 from said crevice 16a conversely, and drawing out along with a guide rail 16.

[0020] {Configuration which is a cleaning means} The configuration of the cleaning means 11 which is cleaning equipment from which the toner which remained to the photo conductor drum 7 next is removed is explained.

[0021] As shown in drawing 1  $R > 1$  and drawing 5, the cleaning means 11 concerning this example attaches 11d of support plate gold which has elastic cleaning-blade 11a at a tip at the cleaning frame 13, and elastic cleaning-blade 11a is made to carry out a pressure welding to the front face of the photo conductor drum 7. Moreover, it is the hand of cut of the photo conductor drum 7, and it has attached in the upstream of said elastic cleaning-blade 11a so that float sheet 11b which is a sheet member may contact the front face of the photo conductor drum 7. Thereby, if the photo conductor drum 7 rotates, the toner which remained to this drum 7 fails to be scratched by elastic cleaning-blade 11a, and this will be dipped up by float sheet 11b and they will be collected to waste toner compartment 11c.

[0022] Said elastic cleaning-blade 11a is the product made of rubber of the shape for example, of a chip,

and is constituted by polyurethane rubber, silicone rubber, etc. Moreover, said float sheet 11b sticks and attaches resin sheets, such as polyethylene terephthalate, in the cleaning frame 13 with a double-sided tape etc.

[0023] Thus, since the lubrication effectiveness by the recovery object cannot be expected when recovery objects, such as a toner, hardly exist in the pressure-welding section if it is in the cleaning configuration which carries out the pressure welding of the elastic cleaning-blade 11a to the photo conductor drum 7, the cleaning means 11 begins to use and frictional force sometimes tends to become the highest. For this reason, there is fear, such as a running torque rise of the photo conductor drum 7 and an abnormal sound. Therefore, if it is in this example, as shown in drawing 1  $R > 1$  and drawing 2, the particle shape has applied the lubricant 20 of an indeterminate form to the edge section of said elastic cleaning-blade 11a. Moreover, the lubricant 21 of a globular form [ particle shape / the ] is applied to the front face of the photo conductor drum 7.

[0024] In addition, as a spreading condition of lubricant 20 and 21, globular form lubricant 21 adheres only to a non-dense to indeterminate form lubricant 20 adhering densely. It is because its adhesion force is weak since globular form lubricant 21 has few tangle of said particle, and it is easy to separate to what this cannot separate in easily from the location when indeterminate form lubricant 20 has a bad fluidity since the shape of toothing on the front face of a particle becomes entangled mutually, and it applies. However, since globular form lubricant 21 has the smooth particle front face to indeterminate form lubricant 20, a fluidity is very good and lubricity's is very high.

[0025] By applying the indeterminate form lubricant 20 and the globular form lubricant 21 which have the above properties, the lubrication engine performance can be held between cleaning-blade 11a and the photo conductor drum 7 over a long period of time from the use early stages of a process cartridge B.

[0026] That is, there is a possibility that an abnormal sound may occur in early stages of use of a process cartridge, only by applying the lubricant 20 of an indeterminate form particle to the edge section of cleaning-blade 11a. Only with the lubricant of an indeterminate form particle, it still has the low lubrication effectiveness, and since the frictional force between cleaning-blade 11a and the photo conductor drum 7 is large, it is for the whole blade to vibrate. This phenomenon becomes easy to happen, so that it becomes the bottom of hot environments. The degree of hardness of blade 11a falls according to an elevated temperature, the nip of the pressure-welding section increases, and it is considered for frictional force to increase. In addition, generally this abnormal sound disappears by \*\*\*\* whose image formation number of sheets is about ten sheets. This is considered with since the powder and the toner of a sensitization layer which were shaved by rubbing with cleaning-blade 11a collect on the contact section of cleaning-blade 11a and the photo conductor drum 7 and it begins to act as lubricant. Therefore, the abnormal sound of the first stage of operation until the powder and the toner which can delete the sensitization layer of the photo conductor drum 7 by applying the lubricant 21 of a lubricative, very high globular form particle to the front face of the photo conductor drum 7 collect on beforehand can be prevented.

[0027] However, since the lubricant 21 of a globular form particle has weak adhesion force, it will separate from the photo conductor drum 7 immediately, and will be collected in waste toner compartment 11c, and the lubrication effectiveness does not continue for a long time. Therefore, only by applying the lubricant 21 of a globular form particle, after this lubricant 21 separates, a sensitization layer can be deleted and it will be dependent only on the lubrication effectiveness by recovery objects, such as powder and a toner. However, the lubrication effectiveness by said recovery object changes with the recovery conditions, when the amount of recovery decreases extremely or the location which the recovery object of the blade edge section is flown and is lost by vibration etc. is made, the frictional force there becomes large and a possibility that wear, lack, etc. of the cleaning blade edge section may occur has it. However, an equipment environment produces this phenomenon only under hot environments 30 degrees C or more. The rubber degree of hardness of a blade falls according to an elevated temperature, the nip of the pressure-welding section increases, and it is considered because frictional force increases superfluously and becomes severe conditions. Therefore, if the lubricant of the

indeterminate form particle which cannot separate easily like this example is applied to the blade edge section, since lubricant will exist in the edge section over a long period of time and a certain amount of lubrication action will continue being secured, even if the recovery objects of the edge section decrease in number, it can prevent that blade edge \*\*\*\* occurs.

[0028] Next, the lubricant used suitably is explained. As an example of the lubricant 20 of an indeterminate form particle, mean particle diameter is 0.5-10 micrometers first, for example about fluororesins [, such as tetrafluoroethylene and vinylidene fluoride, ], titanium oxide, strontium titanate, and graphite fluoride, zinc stearate, etc. What was ground so that it might become extent is used. In order to apply this to cleaning-blade 11a, the dispersion liquid which made the volatile organic solvent distribute fine particles are used.

[0029] As a concrete organic solvent, alcohols, such as a methanol, ethanol, and isopropanol, Ketones, such as an acetone, a methyl ethyl ketone, and a cyclohexane, N,N-dimethylformamide, Sulfoxides, such as amides, such as N,N-dimethylacetamide, and a SHIMECHIRU sulfoxide Ether, such as a tetrahydrofuran, dioxane, and ethylene glycol monomethyl ether, Ester, such as methyl acetate and ethyl acetate, chloroform, a methylene chloride, Aromatic hydrocarbon, such as aliphatic series halogenated hydrocarbon, such as dichloro ethylene, a carbon tetrachloride, and trichloroethylene, or benzene, toluene, a xylene, a ligroin, mono-chlorobenzene, and dichlorobenzene, can be used.

[0030] As the method of application of these dispersion liquid, although the brush and a brush may be used, if an automatic spreading machine (for example, robot which consists of absorption of the dispersion liquid of the specified quantity, the spreading section which can do discharge, and moving part which can move that spreading section by a program etc.) is used, since management of volume and a spreading region can be performed, it is more desirable.

[0031] In addition, if the particle size of lubricant is too small, coherent becomes high too much, the set particle more than secondary increases, the distribution to a solvent gets worse, and it will be hard coming to treat. Moreover, if particle size is too large, it will be hard coming to condense, and if the adhesion force to a blade becomes weak or it is placed between the blade edge sections to a toner by the particle with a large particle size, it will also be generating the grinding omission of a toner.

[0032] As an example of the lubricant 21 of a globular form particle, it is what made the particle silicon resin, acrylic resin, ethylene acrylic resin, etc. by processes, such as a polymerization method, and the mean particle diameter is 0.5-10 micrometers, for example. What was made into extent is used. as the approach of applying this to the front face of the photo conductor drum 7 -- the fine particles itself -- a brush, a roller, etc. -- sprinkling -- etc. -- the approach of applying directly is used. As a reason of the suitable size range of lubricant, it is the same as that of the case of the lubricant of the indeterminate form particle mentioned above.

[0033] Next, the classification of an indeterminate form particle and a globular form particle is explained with reference to drawing 3 . If it is in this example, an indeterminate form particle and a globular form particle are classified according to the shape factor shown below. In addition, drawing 3 expresses the configuration of a particle and shows the parameter in the following formulas to drawing 3 . Here, K is set to  $K=100 a^2 / 4\pi b$  by the shape factor, when a particle boundary length is set to a and particle projected area is set to b (it becomes a true ball when a shape factor is 100).

[0034] In addition, the measuring method of said parameter samples the image of the lubricant expanded by 1000 times to 30-piece random using a scanning electron microscope, introduces the image information into image-analysis equipment through an interface, and analyzes and asks for it.

[0035] Mean particle diameter is actually 2 micrometers with the globular form lubricant of silicon resin. It is 120, when it is a thing and being asked for the shape factor. It was extent. Then, variation is also taken into consideration in this example, and a shape factor is 130. The following consider as a globular form particle and are 130. What is exceeded defines it as an indeterminate form particle.

[0036] {Experimental result} The comparative-experiments result of the case where image formation is carried out using the cleaning equipment which applied the lubricant of an indeterminate form particle and a globular form particle like the example mentioned above next, and the case where image formation is carried out using other cleaning equipments is shown.

Solvent



- [0037] (Common conditions) It is \*\*\*\* 250 in order to make the severe conditions on which continuation \*\*\*\* of the image of 3% of printing ratios is carried out, and lubricant, a toner, etc. of the cleaning blade edge section tend to fall as durable mode under the environment of the temperature of 32.5 degrees C, and 85% of humidity. People add vibration to image formation equipment for every \*\*.
- [0038] (Example 1 of a comparison) Only what applied concentration [ as opposed to isopropyl ether for a fluoride carbon particle (mean particle diameter of 2 micrometers) ] to the blade edge section by 1mm width of face in the dispersion liquid made into 10wt(s)% as indeterminate form lubricant.
- [0039] (Example 2 of a comparison) Only what applied concentration [ as opposed to isopropyl ether for the silicon resin particle (mean-particle-diameter 0.8  $\mu\text{m}$ ) as globular form lubricant ] to the blade edge section by 1mm width of face in the dispersion liquid made into 10wt(s)%.
- [0040] (This example) What applied to the blade edge section by 1mm width of face by the dispersion liquid which made 10wt(s)% concentration [ as opposed to isopropyl ether for a fluoride carbon particle (an average of 2 micrometers) ] as indeterminate form lubricant, and applied the silicon resin particle (mean-diameter 0.8  $\mu\text{m}$ ) as globular form lubricant to the photo conductor drum front face (depending and sprinkling on a brush).
- [0041] (Result) In the example 1 of a comparison, the abnormal sound occurred over the 8th sheet from the 2nd in early stages of actuation, and it was normal about durability at \*\*\*\* of 6000 sheets. Moreover, in the example 2 of a comparison, although there was no abnormal sound in early stages of actuation, blade \*\*\*\* occurred at the 1800 durable number-of-sheets time.
- [0042] On the other hand, if it was in the cleaning equipment concerning this example, there was no abnormal sound in early stages of actuation, and it was normal also about durability at \*\*\*\* of 6000 sheets.
- [0043] Thus, while applying the lubricant of an indeterminate form particle to the edge section of cleaning-blade 11a, by applying the lubricant of a globular form particle to the photo conductor drum 7, the abnormal sound in early stages of actuation can be abolished, and generating of cleaning-blade \*\*\*\* can be prevented.
- [0044] The [2nd example] The 2nd example is explained with reference to drawing 7 below. In addition, drawing 7 shows a cleaning equipment configuration, and since a basic target is the configuration as the 1st example mentioned above with the same configuration, the same member omits the explanation which attaches the same sign and overlaps. Moreover, the image formation equipment equipped with the process cartridge and this cartridge using this cleaning equipment is the same as that of the 1st example.
- [0045] Now, although the lubricant of an indeterminate form particle was applied to the edge section of cleaning-blade 11a and the lubricant of a globular form particle was applied to the front face of the photo conductor drum 7 in the 1st example mentioned above At the point which applies the lubricant 20 of an indeterminate form particle to the edge section of cleaning-blade 11a in this 2nd example, although it is the same Instead of applying to the photo conductor drum 7 on a front face, the lubricant 21 of a globular form particle differs at the point applied to the contact section of float sheet 11b which contacts this drum 7.
- [0046] The globular form particle lubricant 21 applied to said float sheet 11b is gradually transferred to the front face of the photo conductor drum 7 with rotation of the photo conductor drum 7, and produces the lubrication effectiveness. In addition, the same thing as what was stated in the 1st example mentioned above is used, and the globular form particle lubricant 21 used for this example is applied in the form which the organic solvent which also stated the method of application in the 1st example was made to distribute.
- [0047] If it is in this 2nd example, compared with the case of the 1st example mentioned above, the method of application of globular form particle lubricant becomes easy. That is, applying to the photo conductor drum 7 with a brush etc. with fine particles requires time amount for carrying out uniform spreading, and it also tends to produce scattering of fine particles. However, since uniform spreading to float sheet 11b can be performed when applying to float sheet 11b in the form where the solvent was distributed, the amount of the lubricant transferred to the front face of the photo conductor drum 7 will also become uniform from there. Therefore, handling will become far easy if even management of a

solvent is ensured.

[0048] With the image formation equipment using the cleaning equipment shown in {experimental result} drawing 7, image formation was carried out and the cleaning effectiveness was checked.

Suppose that experiment conditions are the same as that of what was stated in the 1st example, and the spreading conditions of lubricant are applied to the blade edge section by 1mm width of face in the dispersion liquid which made 10wt(s)% concentration [ as opposed to isopropyl ether for the fluoride carbon particle (mean particle diameter of 2 micrometers) as indeterminate form particle lubricant ]. And concentration [ as opposed to isopropyl ether for the silicon resin particle (mean-particle-diameter 0.8  $\mu\text{m}$ ) as globular form lubricant ] should be applied to the float sheet edge section by 1mm width of face in the dispersion liquid made into 10wt(s)%. Consequently, there is no abnormal sound in early stages of actuation, and abnormalities were not seen by \*\*\*\* of 6000 sheets about durability.

[0049] As mentioned above, while applying the lubricant of an indeterminate form particle to the edge section of cleaning-blade 11a, by applying the lubricant of a globular form particle to the drum contact section of float sheet 11b, the abnormal sound in early stages of actuation can be abolished, and generating of cleaning-blade \*\*\*\* can be prevented.

[0050] The other examples of each part of the process cartridge B concerning [Other Example(s)], next the example mentioned above and image formation equipment are explained.

[0051] Although the process cartridge B mentioned above was for forming a monochrome image, a process cartridge is applicable suitable not only when forming a monochromatic image, but for the cartridge which establishes two or more development means and forms the image (for example, 2 color images, 3 color images, or full color \*\*) of two or more colors.

[0052] Moreover, it is possible to use the various developing-negatives methods, such as the 2 component MAG brush developing-negatives method well-known also as the development approach, the cascade developing-negatives method, the touchdown developing-negatives method, and the cloud developing-negatives method.

[0053] Moreover, as an electrophotography photo conductor, the following are contained, for example, without being limited to said photo conductor drum. As a photo conductor, photoconductor is used first and an amorphous silicon, an amorphous selenium, a zinc oxide, titanium oxide, an organic photo conductor (OPC), etc. are contained as photoconductor. Moreover, as a configuration which carries said photo conductor, the shape of body of revolution, such as the shape of the shape of a drum and a belt, and a sheet etc. is included, for example. In addition, if the thing of the shape of the shape of a drum and a belt is generally used, for example, it is in a drum type photo conductor, photoconductor is performed for vacuum evaporation or coating on cylinders, such as an aluminum containing alloy.

[0054] Moreover, although the so-called contact electrification approach was used in the 1st example which also mentioned the configuration of an electrification means above Metal shielding, such as aluminum, is given to the perimeter of Mikata of the tungsten wire used from the former as other configurations. Naturally the configuration which is made to move the forward or negative ion produced by impressing the high voltage to said tungsten wire to the front face of a photo conductor drum, and is uniformly charged in the front face of this drum may be used.

[0055] In addition, as said electrification means, things, such as a blade mold (electrification blade), a pad mold, a block type, a rod mold, and a wire mold, may be used besides said roller mold.

[0056] Moreover, with the process cartridge concerning this invention, it has an electrophotography photo conductor and the present cleaning means at least. Therefore, as the typical mode, a cleaning means, an electrophotography photo conductor, and an electrification means and a development means are cartridge-ized in one, and is made removable on the body of equipment. Moreover, the thing which cartridge-izes a cleaning means, an electrophotography photo conductor, and an electrification means or a development means in one, and makes it removable on the body of equipment. Furthermore, a cleaning means and an electrophotography photo conductor are cartridge-ized in one, and some which are made removable are in the body of equipment.

[0057] Moreover, although the equipment which cartridge-izes a photo conductor drum and a developing roller, equips with this process cartridge, and forms an image was illustrated in the example



mentioned above Even if it is in the image formation equipment attached to the body of equipment direct picking, without cartridge-izing these photo conductor drum, a developing roller, and a cleaning means The same effectiveness can be acquired by using the thing of an example which mentioned above the cleaning equipment from which the toner which remained to the photo conductor drum is removed. [0058] Furthermore, although the laser beam printer was illustrated as image formation equipment in the example mentioned above, naturally it is also possible for it not to be necessary to limit this invention to this for example, and to use it for other image formation equipments, such as an LED printer, an electrophotography copying machine, facsimile apparatus, or a word processor.

[0059]

[Effect of the Invention] Since this invention was constituted as cleaning equipment was mentioned above, if it is in early stages of use and continues for a long period of time by the globular form particle again, the lubrication action between an elastic blade and an electrophotography photo conductor is obtained by the indeterminate form particle. For this reason, when an image is formed with the process cartridge or image formation equipment using this cleaning equipment, the abnormal sound by friction between said elastic blades and electrophotography photo conductors occurs, or a possibility that \*\*\*\*\* may occur to an elastic blade can be prevented.

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[Translation done.]